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Perceived Effectiveness of E-Learning for Technology Instruction in Public Library Staff Development Programs: A Survey Based on the Technology Acceptance Model

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PERCEIVED EFFECTIVENESS OF E-LEARNING FOR TECHNOLOGY INSTRUCTION IN PUBLIC LIBRARY STAFF DEVELOPMENT PROGRAMS: A SURVEY BASED ON THE TECHNOLOGY ACCEPTANCE MODEL

Submitted by

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ABSTRACT

The purpose of this research study was to determine the perceived effectiveness of e-learning for staff members in public libraries. In addition, the effects of user demographics - including a user's age and gender - were analyzed to determine if these factors impacted the perceived effectiveness of e-learning as a training delivery model.

Davis's Technology Acceptance Model (1989) was used to develop a questionnaire related to the perceived effectiveness and value of e-learning, and a survey of public library staff members across the United States was conducted. Results of the survey showed the impact that previous e-learning experience and the user's age had on the perception of this method of instruction; younger staff members and those who had previously completed e-learning modules were more likely to consider it to be an effective way to learn new information. The survey results provide valuable implications for organizations using e-learning as a component of a technology acceptance program and can help inform decisions related to the implementation of e-learning programs. Best practices in the development of technology training programs and opportunities for additional studies are also discussed.

KEYWORDS

technology adoption, technology acceptance model, training, public libraries, e-learning

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1. INTRODUCTION

Technology adoption presents a problem for any organization; resistance to change is a permanent fixture in many organizations and is a threat to any company's productivity and staff morale (Dent, 1999; Weick & Quinn, 1999; Jones, 2010; Keen, 1981). Public libraries, generally accepted as knowledge repositories and supporters of lifelong learning, are not immune to this resistance to change (Palmour, 1980; Spacey, Goulding, & Murray, 2013; Fernandez & Rainey, 2006). However, librarians, information technology professionals, training managers, and other leaders can positively change the way that all library staff members approach technology adoption and acceptance with careful consideration of the impact of training; studies demonstrate that training has a directly beneficial effect on the rate of both organizational change (Hayes, 2014; Stanleigh, 2008; Watkins & Marsick, 2003; Bellou & Chatzinikou, 2015) and technology adoption (Boothby, Dufour, & Tang, 2010; Hickman & Rogers, 2007; Straub, 2009).

The purpose of this study is to determine if e-learning is perceived to be an effective instructional delivery method that positively impacts technology acceptance in public library staff. E-learning has many advantages for both the organization and the learner: trainings are considerably cheaper to deliver online, rather than face-to-face; learners are able to control their learning experience and pace, leading to higher satisfaction in the experience; and e-learning can help organizations generate a more positive learning culture and increase overall employee performance (Caudill, 2015). With the constant influx of technological change for librarians and library staff, it is important for library administrators to understand the most effective ways to implement this change in their organization. Using the Technology Acceptance Model developed

in 1989 by researcher Fred Davis, this study will examine several factors that may lead to an increased rate of adoption in library staff and provide recommendations for training programs and methods for public libraries.

1.1 PUBLIC LIBRARIES & TECHNOLOGY

Public libraries in the United States have undergone a tremendous shift in service models as a result of the digital revolution (Casey & Savastinuk, 2006; Varnum, 2014; Knox, 2011; Koerber, 2015; Bertot, Jaeger, & McClure, 2011). Gone are the days of the "traditional" public library with card catalogs and dusty shelves; now, public libraries are community hubs offering a multitude of services for the public, including computer training, 3-D printing, and internet access (Hoffman, Bertot, & Davis, 2012). Studies conducted by the American Library Association and the Pew Research Center, among others, demonstrate not only the shift in services provided in public libraries, but also the changing values of the American population in regards to public libraries ("Libraries Connect Communities," 2007 & 2012; Zickuhr, Rainie, & Purcell, 2013). Communities expect their libraries to be places of knowledge and learning, and in order to meet that expectation, library staff must continually update their understanding of technology.

However, this change has not been without conflict among public library professionals. Conley (2010) identifies that librarians are not as accepting of technology as other professionals may be due to a factor called "subject culture." Because traditional librarians have relied on books for

knowledge for hundreds of years, the concept of transitioning knowledge and discovery of knowledge to computers can be a barrier to technology acceptance.

With the expansion of the public library's role comes additional duties, responsibilities, and job requirements for public library staff. Meeting these needs requires a continued dedication to professional development for all staff in these organizations. However, training costs, staffing shortages, and an increasing number of "technologies librarians need to know" place a number of restrictions on staff who are already being asked to do more with less (Blowers, H. & Reed, L., 2006; Putnam, L., 2016; Harhai, M. & Kreuger, J., 2016; Koh, K. & Abbas, J., 2015; Knox, K. C., 2011; Koerber, J., 2015). These conflicting needs lead libraries to consider alternative training methods - namely, e-learning, due to its benefits.

1.2 E-LEARNING OVERVIEW, BENEFITS, & CHALLENGES

Research has shown that technology and learning are becoming more and more intertwined. Recent studies conducted by the Pew Research Center show an increase in the amount of workplace e-learning that is being conducted and an increasing reliance on e-learning for professional development and employee training (Horrigan, 2016). E-learning, which is also referred to as computer-based training (CBT) and web-based training (WBT), is a general term referring to any kind of training delivered through some kind of modern, web-enabled device, such as a computer or mobile phone; for the purpose of this study, we are using the following definition:

E-learning is generally defined as a learning opportunity delivered via technology; examples include self-paced online training, training videos on YouTube, and webinars. Face-to-face training would not be considered e-learning.

E-learning has long been touted as being the "next big thing" in training, and early research estimated that this type of instructional method would account for as much as 50% of all workplace learning by 2003 (Carliner & Shank, 2008). E-learning, on the surface, was an easy fix for many training woes: online instructional modules would be accessible anytime, anywhere, and would be relatively inexpensive to implement, as it required no travel time or face-to-face instructors.

However, e-learning has not had a 100% adoption rate across all sectors. A multitude of studies have researched the impact that demographics such as age and gender have had on the adoption of e-learning (Park, Son & Kim, 2011; Ahmad & Tarmudi, 2011; Lee, Hsieh, & Chen, 2011); studies have also indicated that organizational support, computer self-efficacy, and prior experiences affect attitudes towards e-learning (Lee, Hsieh, & Chen, 2011).

CONFLICT: PERSONAL VS. PROFESSIONAL LEARNING

Recent studies show that in regards to personal learning, adults mainly rely on reading information rather than taking an online course; 85% of adults learn through reading, versus 15% through an online course (Horrigan, 2016). 63% of employed Americans took a course for professional learning; 75% of this training was conducted at the workplace, and 55% of the

training was conducted online. This conflict of training delivery methods between chosen educational opportunities and mandatory ones is telling; if adults prefer learning by reading, then perhaps e-learning is not an effective way to conduct training in the workplace. In addition, professional learners with higher levels of education or income are more likely to take advantage of online learning, and technology, and adults' access to technology, income, and education level influences their likelihood to engage in e-learning for personal reasons (Horrigan, 2016). Students' lack of familiarity with technology and their personal learning preferences can be important factors in the usage of technology to create valuable learning opportunities.

E-LEARNING IN PUBLIC LIBRARIES

In recent studies conducted by the Chief Officers of State Library Agencies (COSLA), the majority of public library staff have access to e-learning, either through their state library administrative agency, through a federally-funded program like WebJunction, or through organizations like the American Library Association (COSLA, 2014, 2015). Those numbers have risen in recent years; in 2014, 10 state library agencies offered no exclusively-online training: Connecticut, Hawaii, Louisiana, Mississippi, New Hampshire, New Jersey, New Mexico, Oklahoma, Rhode Island, and West Virginia (COSLA, 2014). In the 2015 survey, only Kentucky, Louisiana, Oklahoma, Rhode Island, South Dakota, Virginia, and Wisconsin did not offer online training, down 30% from the previous year (COSLA, 2015).

Even with access to online training (theoretically available anytime, anywhere), staff in public libraries still face an insurmountable barrier: lack of time for training. In a 2016 survey, 90% of

public library staff members reported that they were either interested or very interested in regularly participating in training opportunities; 63% reported that they were unable to, due to an inability to complete training during the workday (Huprich, in press). Time presents the biggest barrier for most learners; a secondary barrier is the cost associated with training. E-learning could, in theory, address both of these concerns.

In addition, because of the demonstrated barriers to training for public library staff and the increased emphasis on technology in public libraries across the country, the opportunity exists for e-learning to provide an ideal educational solution for staff. Prior to doing this, however, we will attempt to understand two things with this study: the role that e-learning plays on technology acceptance, and which factors positively affect the perception that e-learning is an effective instructional method.

2. LITERATURE REVIEW

Literature from several fields was analyzed to further understand the impact of e-learning on technology acceptance. The technology acceptance model, first developed in 1989 by Fred Davis, is an important tool in understanding the impact of multiple factors on the rate of acceptance of technology-based tools and resources. Additional studies conducted on the impact of training on technology adoption, and specifically, those focusing on e-learning as a tool to increase technology acceptance, adoption, and integration are useful in determining how public libraries can positively impact technology adoption rates using e-learning. More recently, studies

have been conducted to determine what impact demographic factors have on the acceptance of e-learning as a valuable professional training tool.

This thesis makes two unique contributions to the literature related to e-learning, public libraries, and technology. First, this study adds to the ever-growing empirical literature on the role of e-learning in staff training programs in libraries by providing an analysis of the impact of employees' perception of e-learning on its effectiveness. In addition, the research conducted here allows us to make valuable contributions to the understanding of how e-learning can be an effective method to increasing technology acceptance rates in public library staff. Best practices and opportunities for future research are also presented.

2.1 TECHNOLOGY ACCEPTANCE MODEL

The purpose of studying the technology acceptance model is to gain insight into how and why users will often adopt some systems readily while ignoring other valuable systems, when given the opportunity to use systems voluntarily. One pivotal study, conducted by Fred D. Davis in the late 1980s, shed light on the way that usefulness – specifically, *perceived* usefulness – will affect a user's acceptance of a specific technology system.

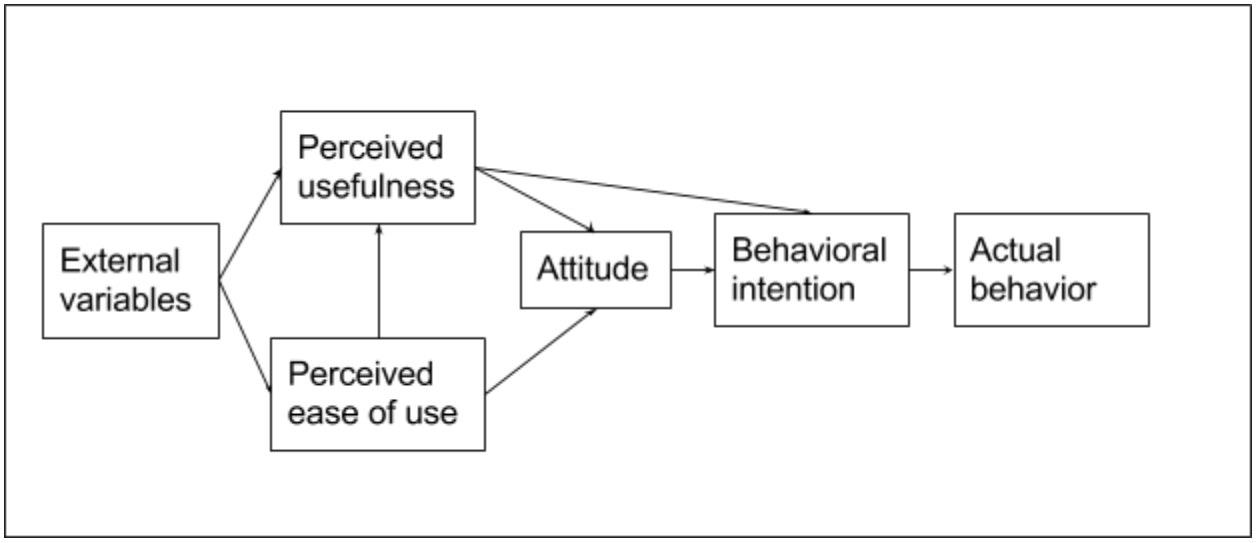
The Technology Acceptance Model, introduced by Davis in 1989, posited that there are two factors that determine whether people accept or reject new systems: perceived usefulness and perceived ease of use. He details these findings thusly:

> *"[P]eople tend to use or not use an application to the extent they believe it will help them perform better. We refer to this first variable as perceived usefulness. Second, even if potential users believe that a given application is useful, they may, at the same time, believe that the systems is too hard to use and that the performance benefits of usage are outweighed by the effort of using the application. That is, in addition to usefulness, usage is thought to be influenced by perceived ease of use"* (320).

By asking users a series of questions through face-to-face interviews and surveys, Davis determined that there were several factors that affected the two variables: perceived usefulness was affected by job effectiveness, productivity and time savings, and importance to the position; perceived ease of use levels were affected by perceived physical effort and mental effort, and perceived ease of learning the new system.

Davis's research included an analysis of the subjects' actual usage of a system; in his 1989 study, he focused on the usage of an e-mail system. His research discovered a direct correlation between the perceived usefulness (PU) of the email system and its actual usage, as well as between the perceived ease of use (PEU) and its usage. However, the correlation was higher with perceived usefulness of the system and its usage. In effect, users who believed that the email system was useful were actually using the system more than those who thought it was easier to use.

Figure 1. Technology acceptance model (TAM). Source: Davis (1989).



Davis has the following to say about his discovery:

> *"In hindsight, the prominence of perceived usefulness makes sense conceptually: users are often driven to adopt an application primarily because of the functions it performs for them, and secondarily for how easy or hard it is to get the system to perform those functions. […] Although difficulty of use can discourage adoption of an otherwise useful system, no amount of ease of use can compensate for a system that does not perform a useful function"* (333-334).

Jiao and Zhao (2014) posit that the method of implementation of innovation can dramatically affect employees' perception of change; according to their study, if employees are not able to contribute to the change process, they may perceive it as a negative instead of a positive change - and thus reject the new technology.

While the method of implementation of innovation can affect technology acceptance, this is not the only factor that can present a barrier to adoption. Studies have shown that demographic, socioeconomic, experiential, and psychological characteristics can impact technology adoption.

Biological gender has been shown to affect rates of technology adoption; different factors influence the genders differently. Studies determined that women were more likely to be affected by the subjective norms and culture of the organization in the context of technology adoption, whereas men are more affected by perceived usefulness (Venkatesh, Morris & Ackerman, 2001; Venkatesh & Morris, 2000). Researchers have suggested that the implementation process, including training and marketing, be customized to appeal more specifically to each gender, although the implications for having single-gender "tracks" for implementation has yet to be seen (Venkatesh & Morris, 2000).

Age has also shown to affect the rate of technology adoption and innovation diffusion. Research conducted in 2000 demonstrated that workers at varying ages had a range of values and motivations that affected their technology adoption decisions (Morris & Venkatesh); subsequent studies have had consistent findings: younger employees adopt technology faster and more efficiently than their older counterparts (Meyer, 2011; Morris, Venkatesh, & Ackerman, 2005).

2.2 IMPACT OF TRAINING ON TAM

Leaders in the field of the study of the Technology Acceptance Model have long maintained that training is the primary method for organizational leaders to ensure adoption across the

workforce; specifically, Venkatesh and Morris (2000) recommend that training is of the utmost importance in regards to technology acceptance:

> *"Training represents the key method for successful knowledge transfer to users, implementation, and diffusion of new technologies, and is the most popular mechanism used to smooth the transition to new technology in the workplace"* (131).

Davis's research on the Technology Acceptance Model demonstrates that training has a directly beneficial effect on the rate of technology acceptance when usefulness has already been demonstrated. When considering the introduction of a new system, other researchers have also found a few items to note; Chuttur's 2009 study, "Overview of the Technology Acceptance Model: Origins, Developments, and Future Directions," outlines the findings of a number of researchers, including Schultz and Slevin, who conducted an exploratory survey in 1975 that was the basis for future researchers, including Davis. Schultz and Slevin found that "perceived usefulness provided a reliable prediction for self-predicted use of a decision model."

However, demographic characteristics of the learners must be taken into consideration when determining the effectiveness of training on staff; researchers have suggested that, due to the difference in the way that men and women perceive technology, training may need to be customized for men and women (Venkatesh & Morris, 2000):

> *"[T]hey may wish to emphasize usefulness issues for men, while offering women a more balanced analysis that includes productivity aspects, process issues, and testimonials from peers or superiors. These recommendations also have implications for marketing professionals who may find these findings useful in designing advertising campaigns designed to appeal to a specific target group within the population. Again, by targeting outcome expectations vs. process expectations and/or social factors, one may pinpoint important issues related to technology adoption for men and women, respectively. The overall pattern of gender differences also presents organizations with important information in terms of designing organizational and managerial interventions that can foster acceptance and use of new technologies both in the short- and the long-term"* (130).

Research investigating the impact of training on the technology acceptance model and technology adoption has shown that training can have a positive impact on not only TAM but also organizational culture and innovation (Caudill, 2015; Sung & Choi, 2011; Black & Lynch, 2001; Boothby et al, 2010).

Changing demands of customers forces organizations to require employees to continually learn in an effort to maintain relevance in a technology-centered world; workplace learning is not only designed to help employees learn new skills, but to develop a culture where learning opportunities are used to develop the capacity of employees and drive positive change for the organization (Caudill, 2015).

Khan (2012) reports how Maslow's hierarchy of needs relates to training and motivation on employees; if motivation is closely related to achievement, which produces job satisfaction, then employees can thus be trained and motivated with positive rewards, such as certificates, rewards, and trophies, which will then encourage adoption of systems. Khan's research examined the connection between training and motivation in the enhancement of an employee's performance. His hypothesis was that there was a direct correlation between the factors, and his research showed that this was indeed the case (93). But if we examine the works of Davis and others, we know that training does not always lead to a direct increase in the *perceived usefulness* of a system, especially if the training method in question itself could possibly create a technological barrier, as in the case of e-learning.

With the growing popularity of e-learning, examining its role on the impact of the Technology Acceptance Model is a natural next step for researchers.

2.3 BARRIERS TO E-LEARNING EFFECTIVENESS

Despite easy access to e-learning, this method of instruction may not be the most effective for all employees. A wide range of barriers have been shown to affect learner satisfaction with e-learning, rate of completion of e-courses, and likelihood to engage in future e-learning.

Employees encounter several barriers that may prevent them from completing courses: technical problems, time and support, personal motivation, technical skills, and academic skills all influence whether or not students will finish online learning (Tyler-Smith, 2006; Sun et al, 2008; McKay & Vilela, 2011). For e-learners, these barriers can lead to high levels of attrition with online students, and some studies have also shown that learners lack of satisfaction with the course's content, level of interaction, and assessment details will prevent them from starting additional courses (Caudill, 2015; Sun et al, 2008).

Studies have also shown generational differences in the perception of the effectiveness of e-learning. Training and development content, and especially e-learning modules and platforms, are generally tailored for younger workers; older workers may not feel that e-learning is effective for learning new technology, and may prefer face-to-face methods exclusively (Jeske et al, 2012). Users with a lack of workplace technology experience - generally those with an extensive work history prior to 1995 - can have computer anxiety, leading to an unwillingness to engage in e-learning (Laguna, K. & Babcock, R., 1997). Previous studies have also indicated that older workers require a longer time to complete training than their younger counterparts (Sterns & Doverspike, 1989).

Recent studies suggest that completion of e-learning modules may not be effective training tools for older workers, for whom the computer is a significant barrier (Hickman, Rogers & Fisk, 2007). A study conducted in 1991 found that "older" workers in general saw themselves as being

unsuited to new learning; researchers discovered that these workers often lacked confidence in training situation (Plett & Lester).

In addition to age being a contributing factor to the satisfaction with e-learning, research has shown that gender can also play a large role in the acceptance of e-learning as an instructional method. In one study, the following was found:

> *"Men's rating of computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use e-learning are all higher than women's. Additionally, we found that women were more strongly influenced by perceptions of computer self-efficacy and ease of use, and that men's usage decisions were more significantly influenced by their perception of usefulness of e-learning. These findings also suggest that researchers should take into consideration factors of gender in the development and testing of e-learning theories. Managers and co-workers, moreover, should realize that e-learning may be perceived differently by women and men"* (Ong, C. S., & Lai, J. Y., 2006).

2.4 EXTENSION OF PREVIOUSLY CONDUCTED STUDIES

The foundation for this survey is based on several previously discussed constructs:

- The role of public libraries is changing
- Public library staff have an increased number of technology-related job tasks
- Implementation of new technologies is occurring at greater frequencies in libraries
- Training is an effective method to increase technology acceptance
- E-learning is growing in popularity, due to several factors, including cost-effectiveness

This study, then, will attempt to synthesize the research previously conducted to determine if e-learning is an effective method of instruction to positively affect technology acceptance in public libraries.

Researchers who have conducted similar studies have specifically studied the impact of learner anxiety, e-learning, and technology acceptance; generational differences that impact e-learning success; metacognitive awareness; and perceived usefulness and ease of use, among others (Table 1). This study is an extension of these previous studies and research models and is designed to show which factors affect this increasingly-used training method (e-learning) and its impact on an increasingly-important role (technology) in public libraries.

Table 1. Related references about e-learning and technology acceptance

Author(s)	Factors
Sun et al (2006)	Dimensions affecting perceived e-learning satisfaction, including learners, instructors, technology and internet quality, perceived usefulness and ease of use
Fuller, Vician, & Brown (2006)	Computer anxiety, communication apprehension
Ahmad & Tarmudi (2011)	Generational differences, learner satisfaction, training design & quality
Hugget (2014)	Technology consideration, message management
Gallego et al (2011)	Perceived ease of use, perceived usefulness, usage behavior, intention to use, user training, user fit, technological complexity, trainer support
Dunlap & Lowenthal (2013)	Metacognitive awareness, social media, usage of web 2.0 tools
Hickman, Rogers, & Fisk (2007)	Age, memory span, reaction time, vision
Ong & Lai (2006)	Gender, computer self-efficacy
Tarhini, Hone, & Liu (2014)	Gender, age, computer self-efficacy, social norm

3. METHODS OF RESEARCH DESIGN AND DEVELOPMENT

This survey was designed on several constructs listed above; it closely follows studies conducted by Gallego et al (2011) and Lee, Hsieh, & Chen (2011), which were extensions of Davis's

original 1989 study, and has been adapted to provide results with significance to the public library field.

3.1 OVERVIEW & HYPOTHESES

This study examines whether completion of an e-learning module is a factor that influences users' perceptions of e-learning as a valuable tool to learn about technology and positively impact technology acceptance, specifically in public libraries. The following hypotheses were developed as a result of the research connecting e-learning and training on technology acceptance rates and on the impact that demographics have on the perceived effectiveness of e-learning.

3.1.1 Perceived effectiveness of e-learning (PE) & completion of an e-learning module (EL)

In the context of this study, perceived effectiveness of e-learning is determined to be the user's belief that e-learning is generally a valid and useful instructional tool and is a valuable component in a staff development program. Users who have not previously completed an e-learning module may be apprehensive of its value and its effectiveness as a training tool (Fuller, Vician, & Brown, 2006; Liaw & Huang, 2013). Therefore, we can form our first hypothesis:

> **Hypothesis 1 (H1):** Completion of an e-learning module (EL) has a positive effect on the perceived effectiveness of e-learning (PE).

3.1.2 Perceived usefulness of technology (PU), perceived ease of use of technology (PEU), and usage behavior (UB)

These constructs were used in extension of the work of Technology Acceptance Model developed by Davis (1989). In his original study, Davis emphasized the critical finding that would go on to inform and serve as the foundation of many future studies: perceived usefulness and perceived ease of use are very strong of future technology acceptance and usage behavior (UB). As an extension of his work, this study aims to determine if the completion of e-learning impacts these constructs in the public library setting.

> **Hypothesis 2 (H2):** Completion of e-learning module (EL) has a positive effect on perceived usefulness of technology (PU).
>
> **Hypothesis 3 (H3):** Completion of an e-learning module (EL) has a positive effect on perceived ease of use of technology (PEU).

3.1.3 Demographics of study participants and impact on PE

Previous studies outlined above have determined that age and gender can affect a learner's perception of e-learning; this study aims to apply this research to determine its validity in the public library sector.

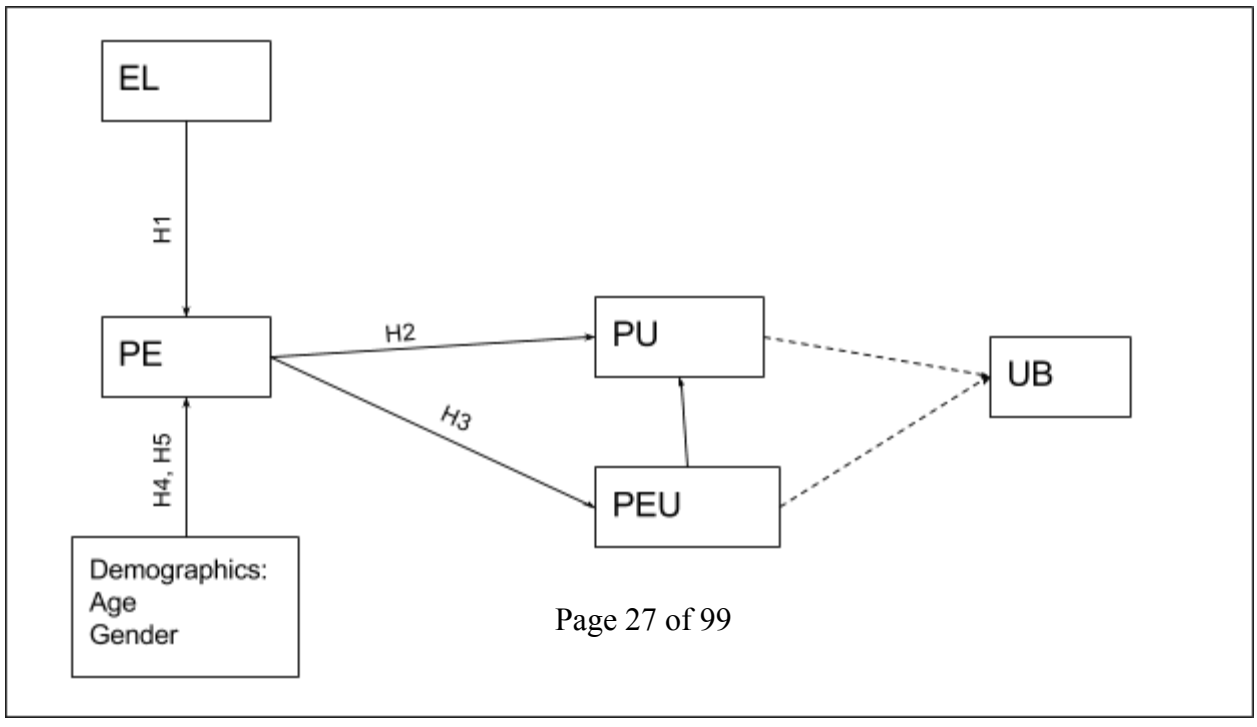
> **Hypothesis 4 (H4):** The perceived effectiveness (PE) of e-learning is different depending

on the gender of the staff member.

Hypothesis 5 (H5): The perceived effectiveness (PE) of e-learning is different depending on the age of the staff member.

By extending Davis's original Technology Acceptance Model to incorporate these additional factors, we can formulate a new model (Figure 2). This figure demonstrates the impact of e-learning (EL) on its perceived effectiveness (PE), along with the impact of demographics (age and gender, specifically) on the perceived effectiveness of e-learning. The survey questionnaire also included items to determine whether the prior completion of e-learning had an impact on the the perceived effectiveness of e-learning modules as a tool to gain further understanding on the usefulness and ease of use of technology. One aspect included in the research model, usage behavior (UB), was not analyzed in this study. There is an opportunity for future researchers to examine factors related to UB in the context of the public library.

Figure 2. New research model



3.2 RESEARCH MEASURES

A questionnaire was developed to gather data from study participants. To ensure validity of the questionnaire, each construct has been mapped to a specific item, which was developed as a result of previous research, as outlined above. The questionnaire included three parts; one part to determine public library experience and experience with e-learning; one part to determine demographic figures; and the final portion asking for agreement with several statements based on theory constructions.

Figures 3 and 4 show the information gathered from the first portion of the study. Approximately 98% of respondents had experience in public libraries; 81% had previously completed an e-learning module for professional development. No responses were excluded from the study based on either of these items; while public library experience was requested for participation, the responses of non-public library staff were analyzed as well. The survey was only distributed to library staff (see Section 3.3) and the likelihood of respondents having familiarity with public libraries, if not direct experience working in them, was very high. Table 2 shows the demographics of the respondents; age and gender information was gathered. No personally identifying information was collected during the study.

Figure 3. Public library experience

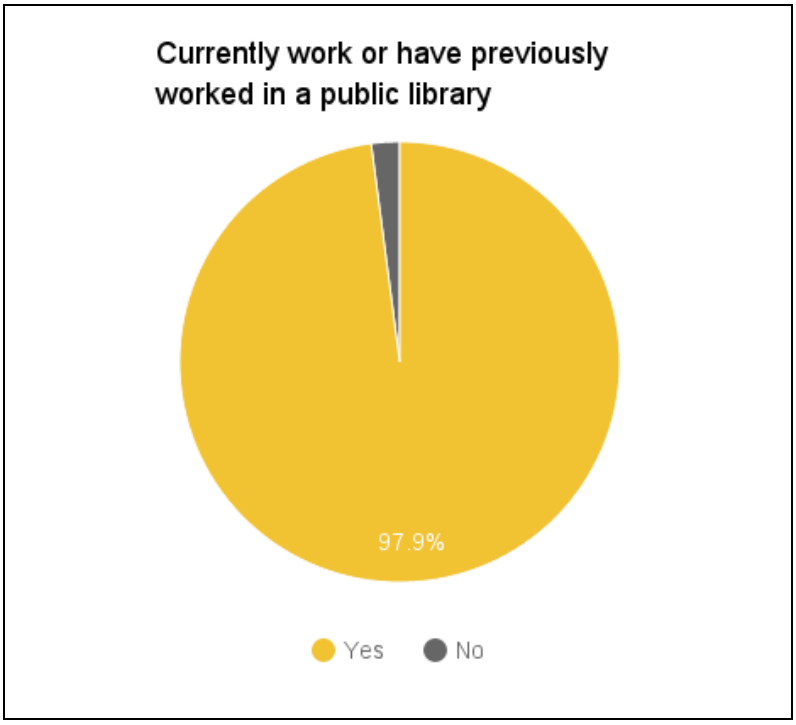


Figure 4. E-learning experience

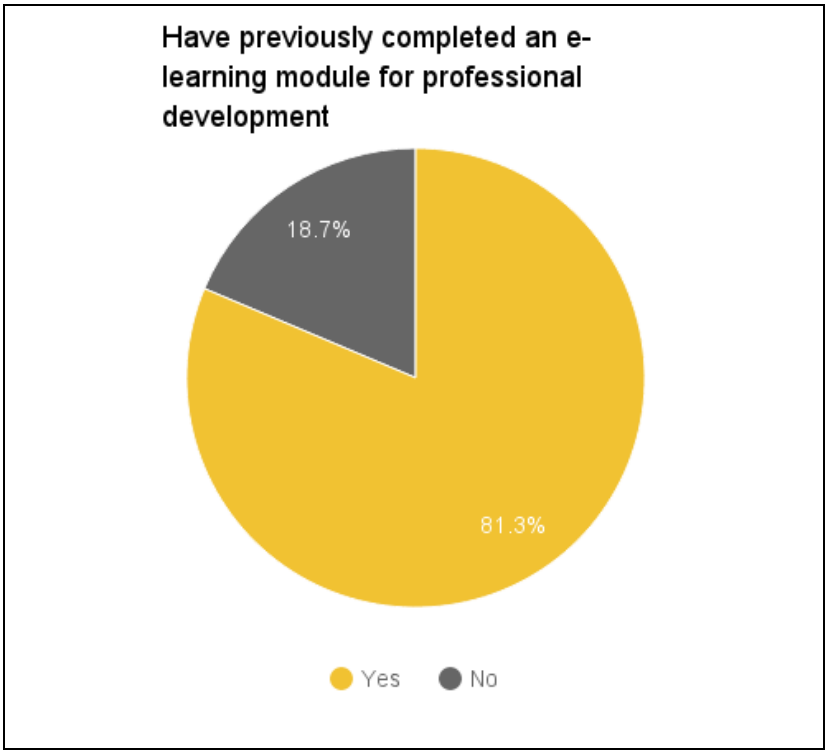


Table 2. Demographics of respondents

Demographics	Number	Percent
Gender		
Male	29	15.03%
Female	163	84.46%
Decline to answer	1	0.52%
Age		
<18	0	0.00%
18-24	1	0.52%
25-34	35	18.13%
35-44	34	17.62%
45-54	47	24.35%
55-64	56	29.02%
65-75	19	9.84%
> 75	0	0.00%
Decline to answer	1	0.52%

The second part of the questionnaire is a nominal scale, collecting demographic information from participants. All information remained confidential and was in no way used to identify participants. Table 2 shows demographics of the respondents.

The third part of the questionnaire is based on the theory constructs listed in Table 3, with 5-point Likert scales where 1 represents strongly disagree and 5 represents strongly agree. Users were given the following instructions:

> *Thank you for participating in this survey. Please take a few moments to answer some questions related to your experiences with and perceptions of e-learning.*

**Please note: e-learning is generally defined as a learning opportunity delivered via technology; examples include self-paced online training, training videos on YouTube, and webinars. Face-to-face training would not be considered e-learning.*

Users were provided an opportunity to select "decline to answer" as an option for each item in the questionnaire.

Table 3. Questionnaire items

Theory construct	Item definition
PE	Q5/PE1- E-learning is an effective way to learn new information.
	Q6/PE2 - E-learning modules are a valuable component in staff training programs.
	Q7/PE3 - Staff members who complete e-learning modules are well-informed.
	Q8/PE4 - E-learning provides a valuable opportunity to learn on-demand.
PU	Q9/PU1- Understanding the importance of new technology is easier if I have access to an e-learning module.
	Q10/PU2 - Completing an e-learning module could help me understand why new technology is being implemented in the library.
PEU	Q11/PEU1 - E-learning modules are effective ways to learn how to use technology tools in libraries.
	Q12/PEU2 - Learning about new devices and technologies is easier through e-learning than through other instructional methods, like face-to-face classes or hands-on workshops.
UB	Q13/UB1 - After completing an e-learning module about new technology, it is likely that staff would feel confident using it in the library.
	Q14/UB2 - After completing an e-learning module about new technology, it is likely that staff would feel confident sharing their knowledge with others.

3.3 DATA COLLECTION

This study used a web-based survey to collect data for the qualitative portion of the research study. The survey was built using SurveyMonkey, an online survey tool. To maintain confidentiality and compliance with IRB protocol, IP addresses and other identifying information was not gathered. 195 responses were collected.

Survey invitation emails (Appendix A) were sent to various group library-focused mailing lists across the country, including one of the public library directors in Georgia, technical support specialists in Georgia's public libraries, the Tennessee Library Association, and the Learning Round Table of the American Library Association (see Appendix B). Emails to participate in the research study were sent beginning on June 10; the web collector was closed on June 24, 2016.

The invitation email stated the purpose of the study and included a URL to the survey. To begin the survey, users were provided informed consent information and asked to provide consent to participate in the research project (Appendix C). Users who were unwilling to accept the informed consent procedures in the survey were thanked for their time and were exited automatically from the survey process.

198 users began the survey. Of those, 195 agreed to the terms and gave consent to participate in the research study. Of these respondents, 97.93% (189) had previously worked in public libraries and 81.53% had previously completed an e-learning module for professional development.

Survey respondents were then provided with ten statements and asked to rate their level of agreement with each question using a Likert scale anchored at Strongly Agree and Strongly Disagree. The statements were adapted from previous, similar surveys that provided data for other closely related research studies. In addition, users were given a “decline to answer” option for each question.

4. RESULTS AND DISCUSSION

This study gathered nominal data from survey respondents: gender, age, library experience, e-learning experience were all collected, as detailed above. In addition, users were asked to provide their level of agreement with several statements using a 5-point Likert scale. The descriptive statistics of the results of this portion of the survey are included in Table 4.

Table 4. Summary of measurement scales

Construct/ Questionnaire Item	**Mean**	**Std Dev**
Perceived effectiveness		
PE1/Question 5	4.1277	0.7125
PE2/Question 6	4.1064	0.7595
PE3/Question 7	3.7287	0.7710
PE4/Question 8	4.3404	0.7320
Perceived usefulness		
PU1/Question 9	3.8432	0.8024
PU2/Question 10	4.0319	0.7083
Perceived ease of use		
PEU1/Question 11	3.8663	0.8021
PEU2/Question 12	2.6524	1.0011
Usage behavior		
UB1/Question 13	3.3048	0.8848
UB2/Question 14	3.3422	0.8983

4.1 SURVEY RESULTS

This study tested 5 hypotheses related to e-learning and technology acceptance (Table 5). Data from the survey were analyzed to determine which hypotheses were supported by statistically significant results.

Of the 5 different hypotheses, only 2 were confirmed by the data: H1 and H5.

- H1: *Completion of an e-learning module (EL) has a positive effect on the perceived effectiveness of e-learning (PE).* This hypothesis was supported by significant *p* values for 3 of 4 questions related to the construct.
- H5: *The perceived effectiveness (PE) of e-learning is different depending on the age of the staff member.* This hypothesis was supported by significant *p* values for 2 of 4 questions related to the construct.

Three hypotheses were unconfirmed by the data:

- H2: *Completion of e-learning module (EL) has a positive effect on perceived usefulness of technology (PU).*
- H3: *Completion of an e-learning module (EL) has a positive effect on perceived ease of use of technology (PEU).*
- H4: *The perceived effectiveness (PE) of e-learning is different depending on the gender of the staff member.*

Table 5. Descriptive statistics

Construct & Hypothesis	**Observed Differences**	**Fisher's Exact Test p-value**	**Supported**
EL -> PE H1	Those with prior e-learning experience rated e-learning as: ● An effective instructional method (Q5) ● A valuable component of staff training (Q6) ● A valuable opportunity to learn on demand (Q8)	Q5: p=0.022 Q6: p=0.004 Q7: p=0.31 Q8: p=0.078	Yes, 3 of 4 p values were significant (Q5, Q6, and Q8)
EL -> PU H2		Q9: p=0.5717 Q10: p=0.2398	No
EL -> PEU H3		Q11: p=0.4854 Q12: p=0.3239	No
Gender -> PE H4		Q5: p=0.2791 Q6: p=0.2314 Q7: p=0.3577 Q8: p=0.6463	No
Age -> PE H5	Younger survey respondents were more likely to consider e-learning to be: ● An effective instructional method (Q5) ● A valuable opportunity to learn on demand (Q8)	Q5: p=0.10 Q6: p=0.43 Q7: p=0.26 Q8: p=0.05	Yes, 2 of 4 p values were statistically significant (Q5 and Q8)

To analyze the data, frequency histograms charts and graphs were created to determine the impact of e-learning. In addition, non-parametric Fisher's Exact Tests were conducted using the tool provided by Vassar at http://vassarstats.net/tab2x2.html. *p* values were considered statistically significant at the following alpha levels:

- Greater than 0.1: no significance
- Between 0.1 and 0.05: weak statistical significance
- Between 0.05 and 0.01: statistically significant
- Less than 0.01: overwhelmingly significant

Since the Likert scale used represents an ordinal scale, the statistical test relied on visually comparing the distributions of agreement ratings followed by the non-parametric Fisher's Exact Test on the 2X2 contingency table where the negative and neutral ratings were collapsed into one category and the two positive rating points on the Likert scale were collapsed in the other.

4.1.1 H1: Impact of e-learning experience on perceived effectiveness

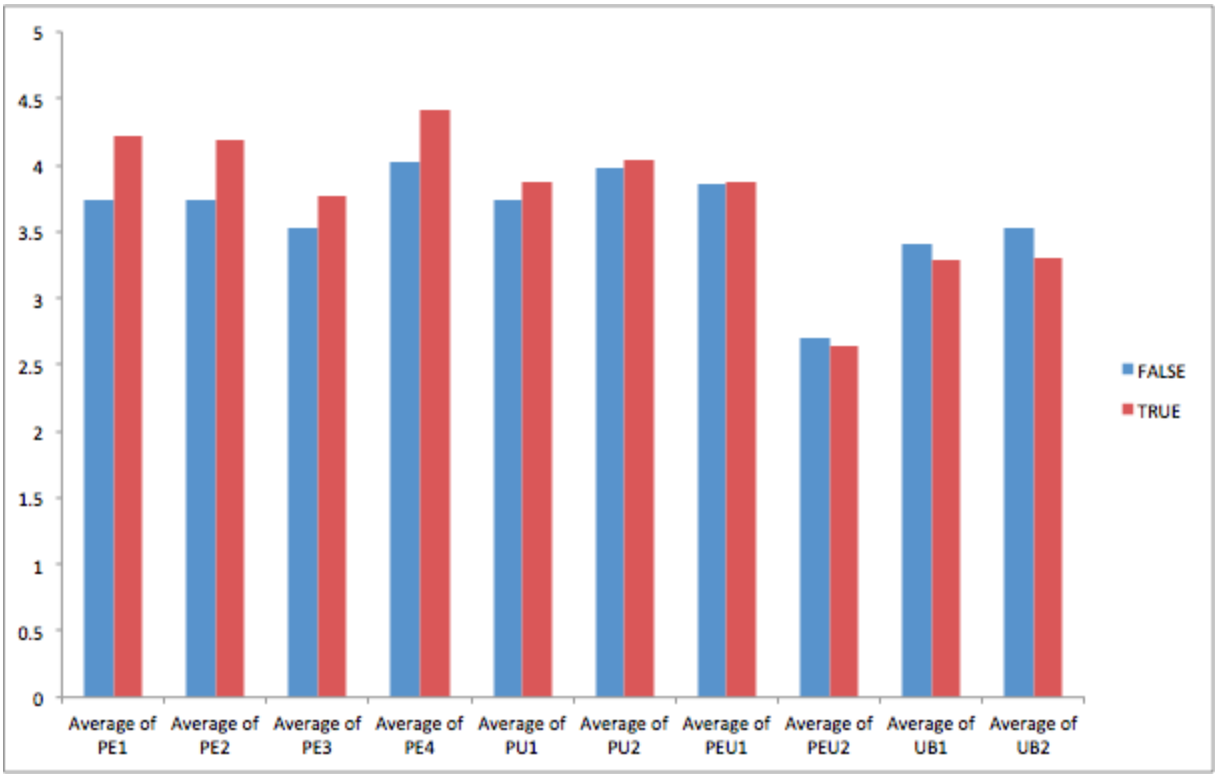
E-learning experience had a varying effect on study constructs (Table 6). Users who had previously completed an e-learning module were, on average, 13% more likely to believe it was an effective way to learn more information (PE1); 12% more likely to believe that e-learning is a valuable component in staff training programs (PE2); 7% more likely to believe that staff members who complete e-learning modules are well-informed (PE3); and 9% more likely to believe that e-learning provides a valuable opportunity to learn on-demand (PE4).

Table 6. Impact of prior e-learning

EL	Avg PE1	Avg PE2	Avg PE3	Avg PE4	Avg PU1	Avg PU2	Avg PEU1	Avg PEU2	Avg UB1	Avg UB2
No	3.74	3.74	3.53	4.03	3.74	3.97	3.85	2.71	3.41	3.53
Yes	4.21	4.19	3.77	4.41	3.87	4.05	3.87	2.64	3.28	3.30

However, completion of e-learning had little impact on constructs PU and PEU and a negative impact on usage behavior (UB). Survey respondents who had previously completed an e-learning module were 4% less likely to believe that staff would feel confident using new technology in the library after completing an e-learning module; they were 6% less likely to believe that staff would feel confident sharing their knowledge after the completion of an e-learning module.

Figure 4. Completion of e-learning and impact on theory constructs



This research hypothesis requires complete data from questions 2 and 5 through 8. If a response had missing data from any of those items, it was removed from this analysis. In all, 186

respondents were included in this analysis, where 33 had no prior e-learning experience and 153 had at least one prior e-learning experience. The data profile indicating support for the research hypothesis was that the 153 who had prior e-learning experience (question 2) would show a higher-level of agreement in the value and effectiveness of e-learning as measured in questions 5-8:

5. E-learning is an effective way to learn new information.
6. E-learning modules are a valuable component in staff training programs.
7. Staff members who complete e-learning modules are well-informed.
8. E-learning provides a valuable opportunity to learn on-demand.

Results for Q5:

Figure 5. Relative Frequency Histogram: EL and Q5

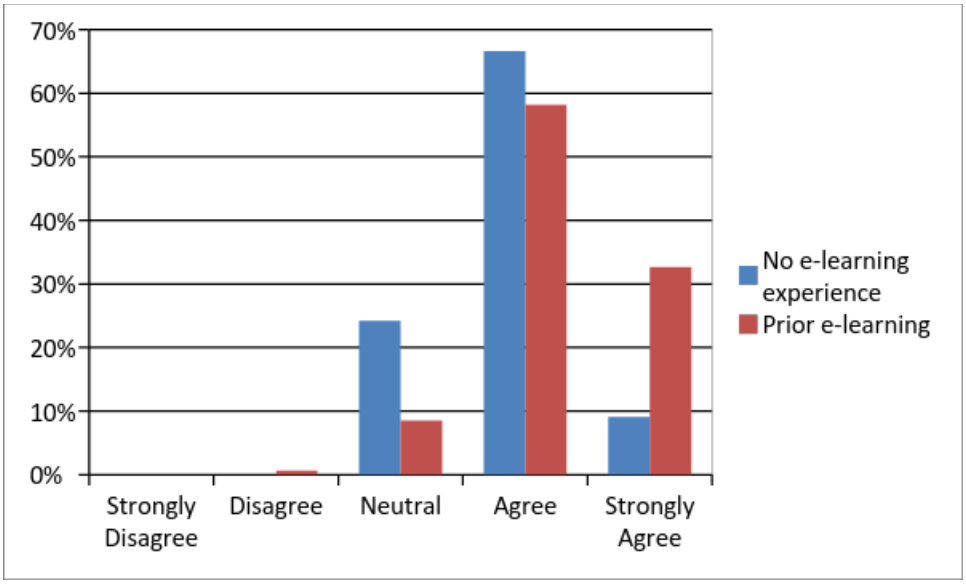


Table 7. Frequency distribution table: EL and Q5

	No e-learning experience	**Prior e-learning**
Strongly Disagree	0	0
Disagree	0	1
Neutral	8	13
Agree	22	89
Strongly Agree	3	50
Totals	33	153
Fisher's Exact p=0.022		

The adjacent histograms of the relative frequency above show a pattern that those without prior e-learning experience have relatively lower levels of agreement that e-learning is an effective way to learn new information. This is confirmed by the Fisher's Exact Test (p=0.022), which clearly indicates a strong statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

Results for Q6:

Figure 6. Relative Frequency Histogram: EL and Q6

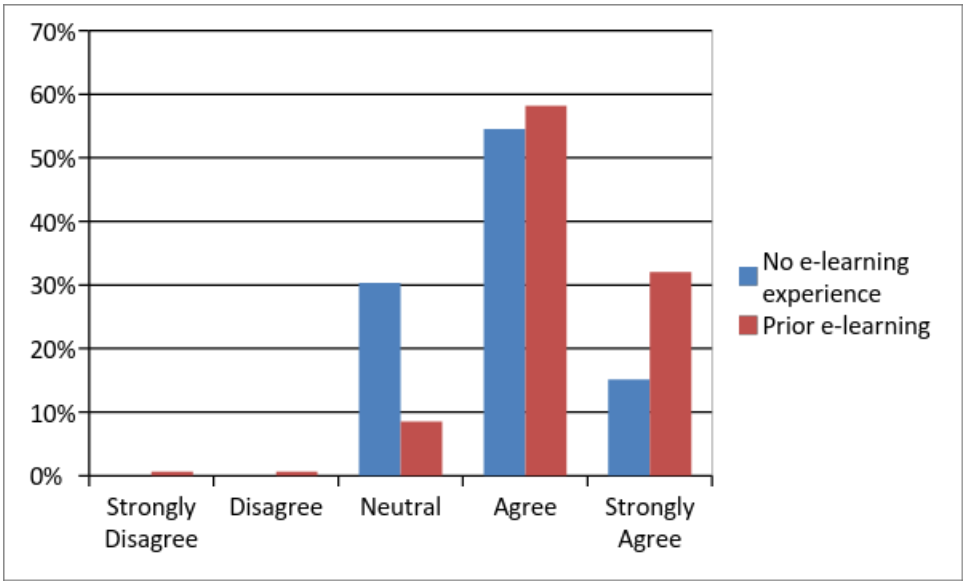


Table 8. Frequency distribution table: EL and Q6

	No e-learning experience	**Prior e-learning**
Strongly Disagree	0	1
Disagree	0	1
Neutral	10	13
Agree	18	89
Strongly Agree	5	49
Totals	33	153
Fisher's Exact Test p=0.004		

The adjacent histograms of the relative frequency above show a pattern that those without prior e-learning experience have relatively lower levels of agreement that e-learning modules are a valuable component in staff training programs. This is confirmed by the Fisher's Exact Test (p=0.004), which clearly indicates a very strong statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

Results for Q7:

Figure 7. Relative Frequency Histogram: EL and Q7

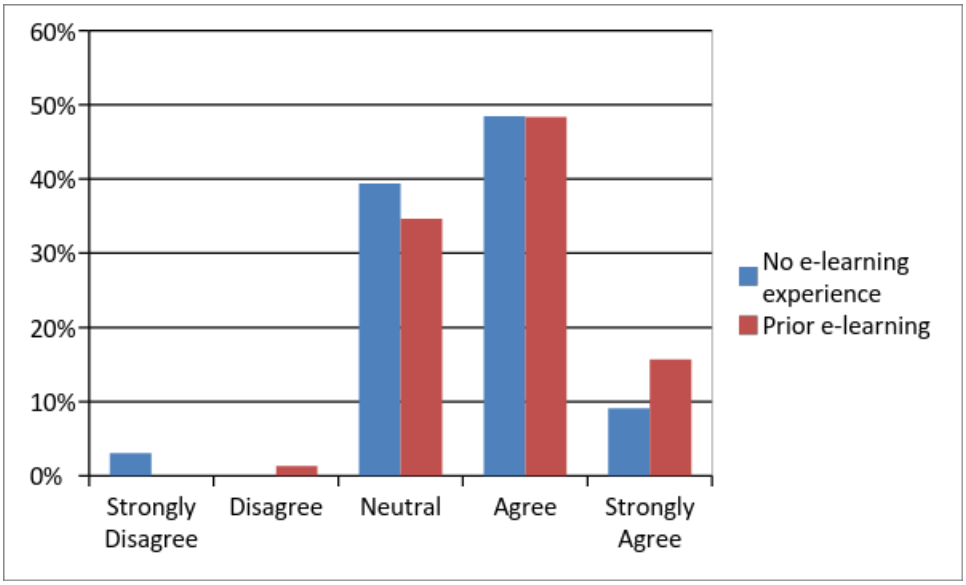


Table 9. Frequency distribution table: EL and Q7

	No e-learning experience	**Prior e-learning**
Strongly Disagree	1	0
Disagree	0	2
Neutral	13	53
Agree	16	74
Strongly Agree	3	24
Totals	33	153
Fisher's Exact Test p=0.31		

The adjacent histograms of the relative frequency above show a no-difference pattern that those without prior e-learning experience same distribution of levels of agreement that staff member who complete e-learning modules are well informed. This is confirmed by the Fisher's Exact Test (p=0.31), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

Question 7 was slightly different than the other survey statements; while questions 5, 6, and 8 asked respondents to assess the impact of e-learning and its value for learning new information on-demand, question 7's focus was on the perception of staff members who complete e-learning modules. Because previous research had determined that the perception of e-learning can impact

its adoption and that subjective norms are more impactful for certain groups than others, this statement was chosen to test the validity of those constructs.

Results for Q8:

Figure 8. Relative Frequency Histogram: EL and Q8

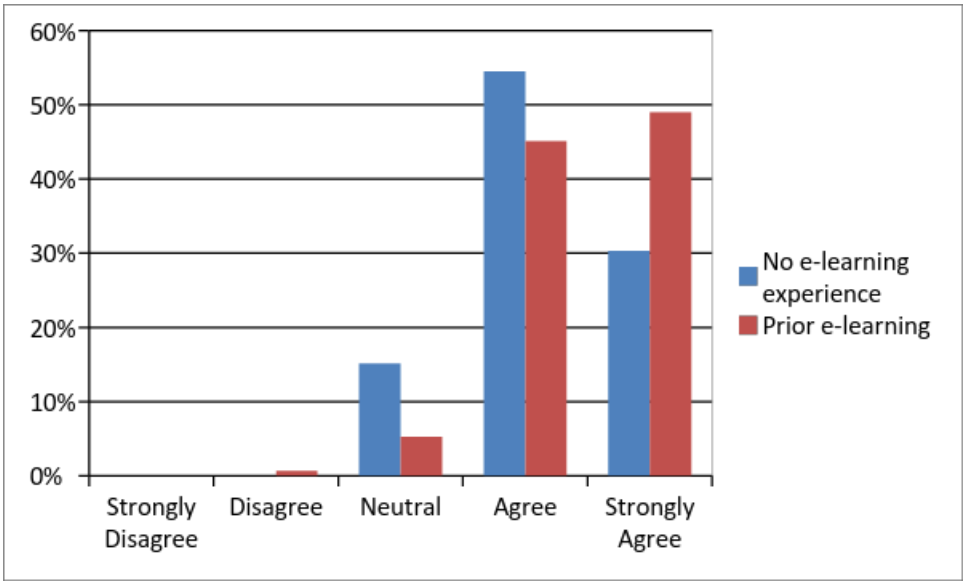


Table 10. Frequency distribution table: EL and Q8

	No e-learning experience	**Prior e-learning**
Strongly Disagree	0	0
Disagree	0	1
Neutral	5	8
Agree	18	69
Strongly Agree	10	75
Totals	33	153
Fisher's Exact Test p=0.078		

The adjacent histograms of the relative frequency above show a pattern that those without prior e-learning experience have relatively lower levels of agreement that e-learning modules provide a valuable opportunity to learn on demand. This is confirmed by the Fisher's Exact Test ($p=0.078$), which indicates a weak statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

4.1.2 H2: Impact of e-learning experience on perceived usefulness of technology

This research hypothesis requires complete data from questions 2, 9 and 10. If a response had missing data from any of those items, it was removed from this analysis. In all, 184 respondents were included in this analysis, where 33 had no prior e-learning experience and 151 had at least one prior e-learning experience. The data profile indicating support for the research hypothesis was that the 151 who had prior e-learning experience (question 2) would show a higher-level of agreement in the perceived usefulness of technology, as shown in questions 9 and 10:

9. Understanding the importance of new technology is easier if I have access to an e-learning module.
10. Completing an e-learning module could help me understand why new technology is being implemented in the library.

Results for Q9:

Figure 9. Relative Frequency Histogram: EL and Q9

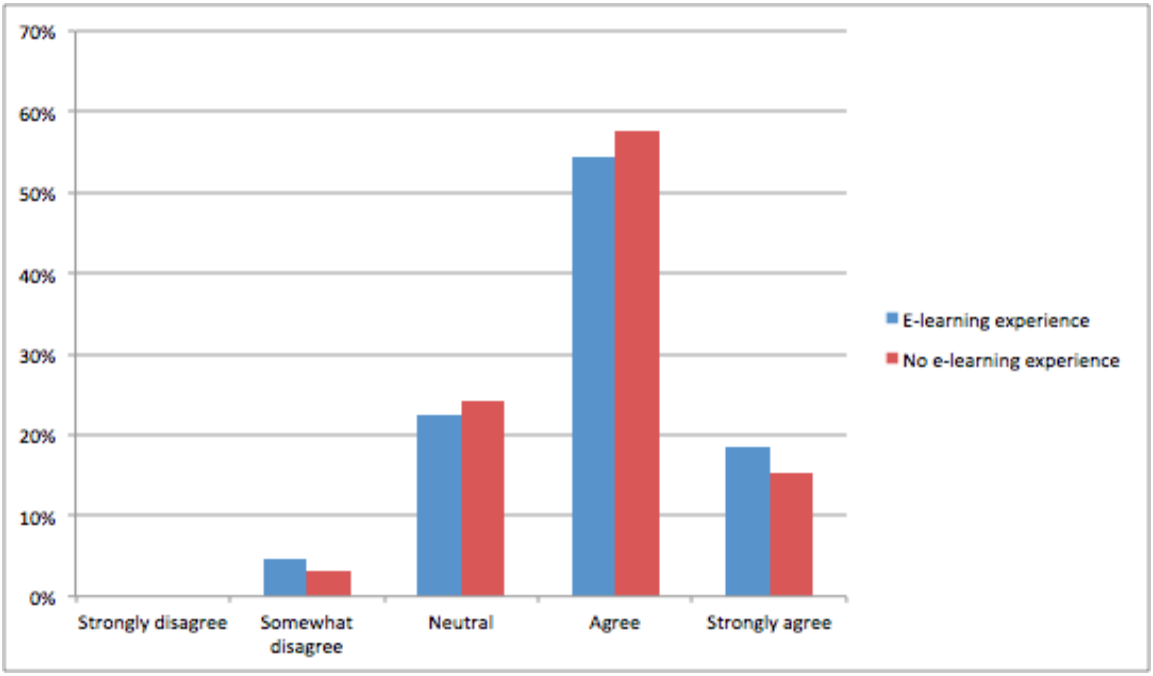


Table 11. Frequency distribution table: EL and Q9

	No e-learning	**Prior e-learning**
Strongly disagree	0	0
Somewhat disagree	1	7
Neutral	8	34
Agree	19	82
Strongly agree	5	28
Total	33	151
Fisher's Exact Test p=0.5717		

The adjacent histograms of the relative frequency above show a no-difference pattern; those without prior e-learning experience the same distribution of levels of agreement in the perceived usefulness of technology as those who have completed prior e-learning. This is confirmed by the Fisher's Exact Test (p=0.5717), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

Results for Q10:

Figure 10. Relative Frequency Histogram: EL and Q10

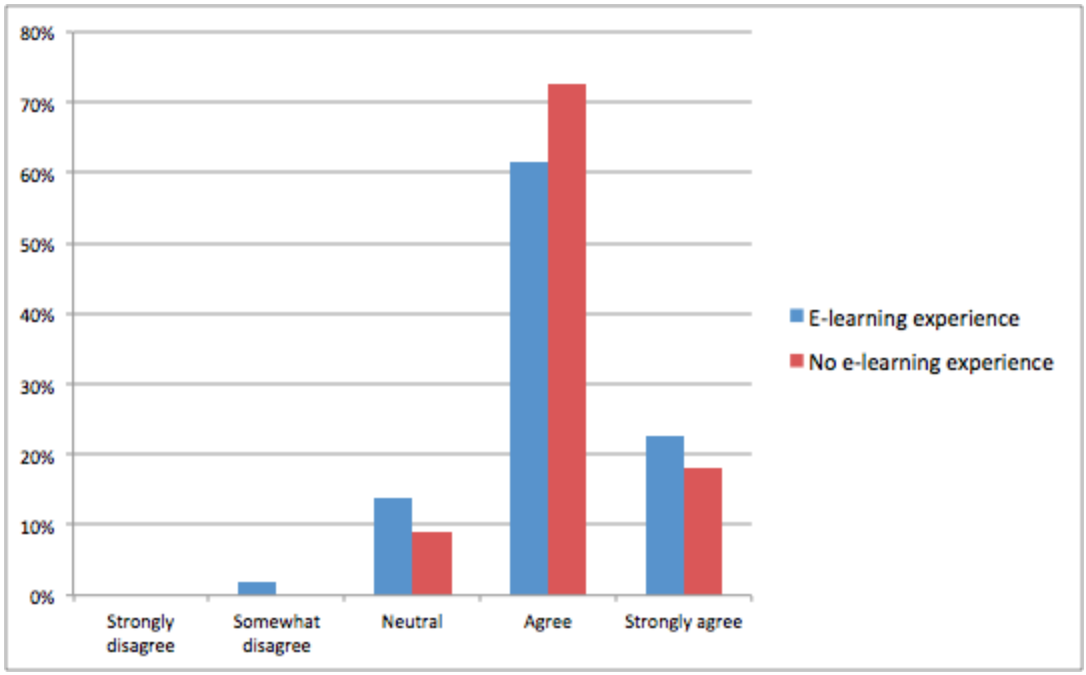


Table 12. Frequency distribution table: EL and Q10

	No e-learning	**Prior e-learning**
Strongly disagree	0	0
Somewhat disagree	0	3
Neutral	3	21
Agree	24	93
Strongly agree	6	34
Total	33	151
Fisher's Exact Test p=0.2398		

The adjacent histograms of the relative frequency above show a no-difference pattern; those without prior e-learning experience the same distribution of levels of agreement in the perceived usefulness of technology as those who have completed prior e-learning. This is confirmed by the Fisher's Exact Test (p=0.2398), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

4.1.3 H3: Impact of e-learning experience on perceived ease of use

This research hypothesis requires complete data from questions 2, 11 and 12. If a response had missing data from any of those items, it was removed from this analysis. In all, 185 respondents were included in this analysis, where 33 had no prior e-learning experience and 152 had at least one prior e-learning experience. The data profile indicating support for the research hypothesis

was that the 152 who had prior e-learning experience (question 2) would show a higher-level of agreement in the perceived ease of use of technology, as shown in questions 11 and 12:

11. Understanding the importance of new technology is easier if I have access to an e-learning module.
12. Completing an e-learning module could help me understand why new technology is being implemented in the library.

Results for Q11:

Figure 11. Relative Frequency Histogram: EL and Q11

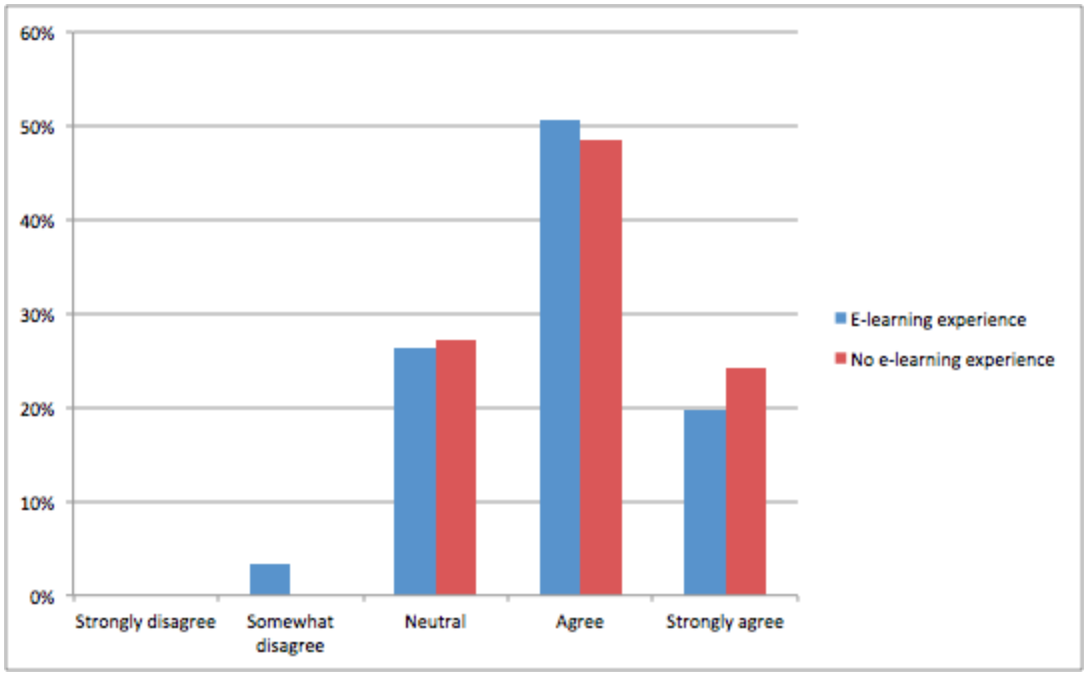


Table 13. Frequency distribution table: EL and Q11

	No e-learning	**Prior e-learning**
Strongly disagree	0	0
Somewhat disagree	0	5
Neutral	9	40
Agree	16	77
Strongly agree	8	30
Total	33	152
Fisher's Exact Test p=0.4854		

The adjacent histograms of the relative frequency above show a no-difference pattern; those without prior e-learning experience the same distribution of levels of agreement about the effectiveness of e-learning in affecting perceived ease of use of technology as those who have completed prior e-learning. This is confirmed by the Fisher's Exact Test (p=0.4854), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

Results for Q12:

Figure 12. Relative Frequency Histogram: EL and Q12

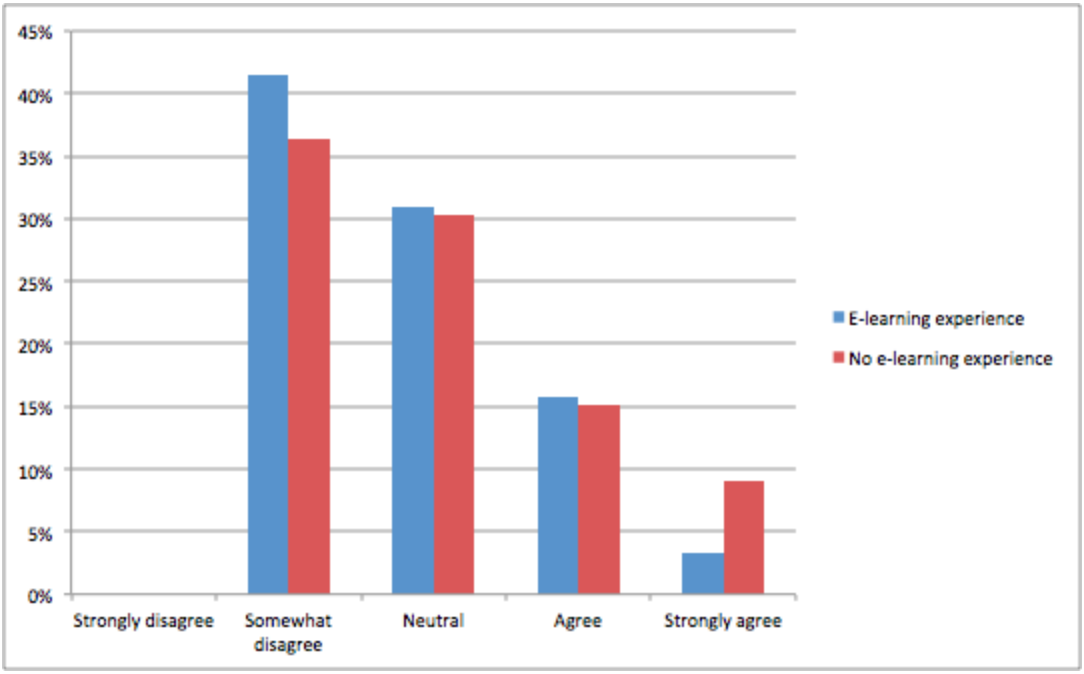


Table 14. Frequency distribution table: EL and Q12

	No e-learning	**Prior e-learning**
Strongly disagree	3	13
Somewhat disagree	12	63
Neutral	10	47
Agree	5	24
Strongly agree	3	5
Total	33	152
Fisher's Exact Test p=0.3239		

The adjacent histograms of the relative frequency above show a no-difference pattern; those without prior e-learning experience the same distribution of levels of agreement with question 12, "Completing an e-learning module could help me understand why new technology is being implemented in the library," as those who have completed prior e-learning. This is confirmed by the Fisher's Exact Test (p=0.3239), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to whether the respondent had prior experience with e-learning.

4.1.4 H4: Impact of gender on perceived effectiveness of e-learning

This research hypothesis requires complete data from questions 4 through 8. If a response had missing data from any of those items, it was removed from this analysis. In all, 186 respondents were included in this analysis, with gender distribution listed in the table below.

Table 15. Gender distribution frequency

Gender	**Frequency**
Female	158
Male	28
Total	186

The data profile indicating support for the research hypothesis was that male respondents (question 4) would show a higher-level of agreement in the value and effectiveness of e-learning as measured in questions 5-8:

5. E-learning is an effective way to learn new information.
6. E-learning modules are a valuable component in staff training programs.
7. Staff members who complete e-learning modules are well-informed.
8. E-learning provides a valuable opportunity to learn on-demand.

Results for Q5:

Figure 13. Relative Frequency Histogram: gender and Q5

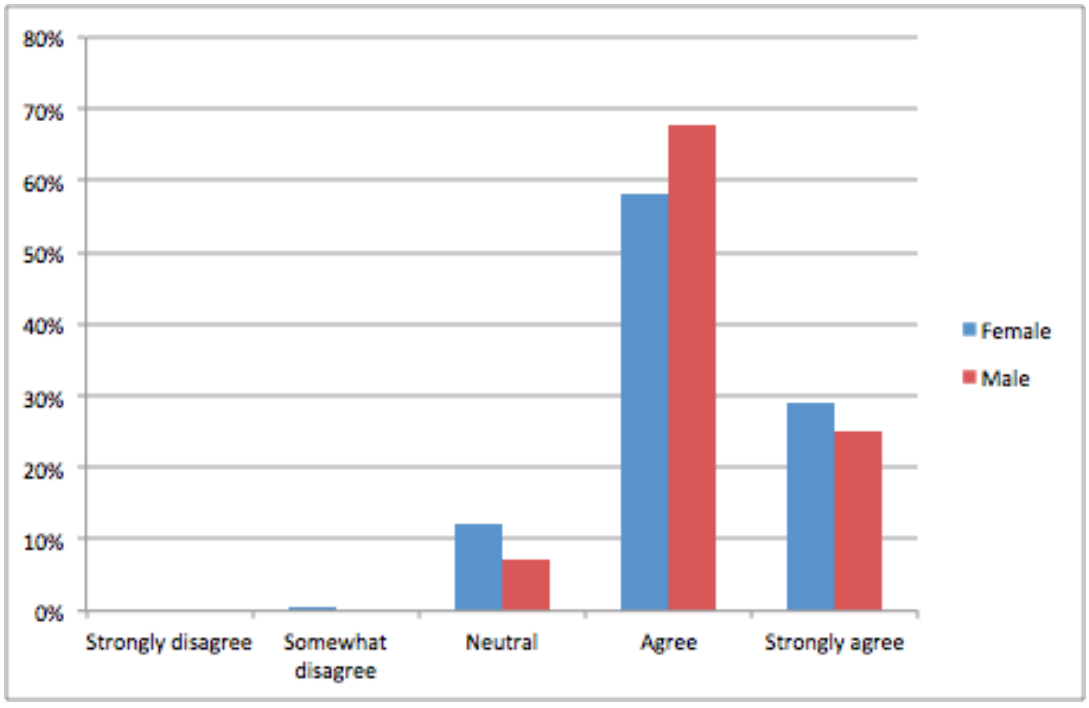


Table 16. Frequency distribution table: gender and Q5

	Female	**Male**
Strongly disagree	0	0
Somewhat disagree	1	0
Neutral	19	2
Agree	92	19
Strongly agree	46	7
Total	158	28
Fisher's Exact Test p=0.2791		

The adjacent histograms of the relative frequency above show a no-difference pattern; males experience the same distribution of levels of agreement with Q5, "E-learning is an effective way to learn new information," as women. This is confirmed by the Fisher's Exact Test (p=0.2791), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to gender.

Results for Q6:

Figure 14. Relative Frequency Histogram: gender and Q6

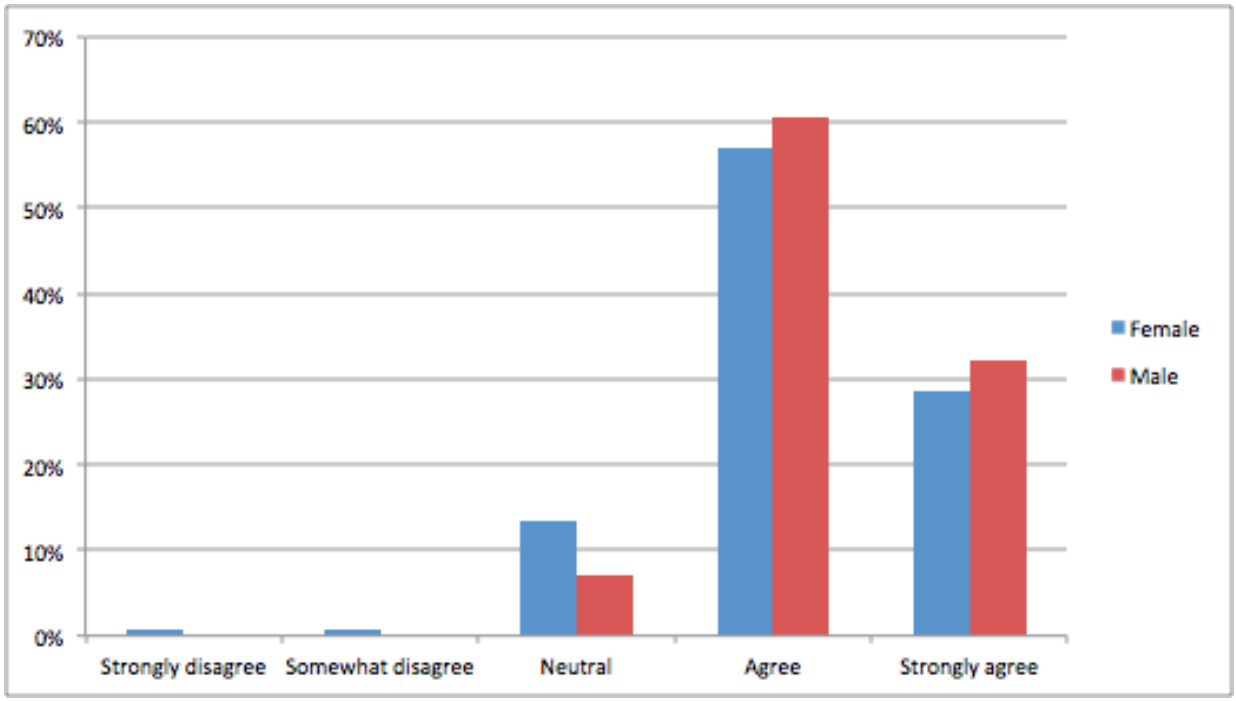


Table 17. Frequency distribution table: gender and Q6

	Female	**Male**
Strongly disagree	1	0
Somewhat disagree	1	0
Neutral	21	2
Agree	90	17
Strongly agree	45	9
Total	158	28
Fisher's Exact p=0.2314		

The adjacent histograms of the relative frequency above show a no-difference pattern; males experience the same distribution of levels of agreement with Q6, "E-learning modules are a valuable component in staff training programs," as women. This is confirmed by the Fisher's Exact Test (p=0.2314), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to gender.

Results for Q7:

Figure 15. Relative Frequency Histogram: gender and Q7

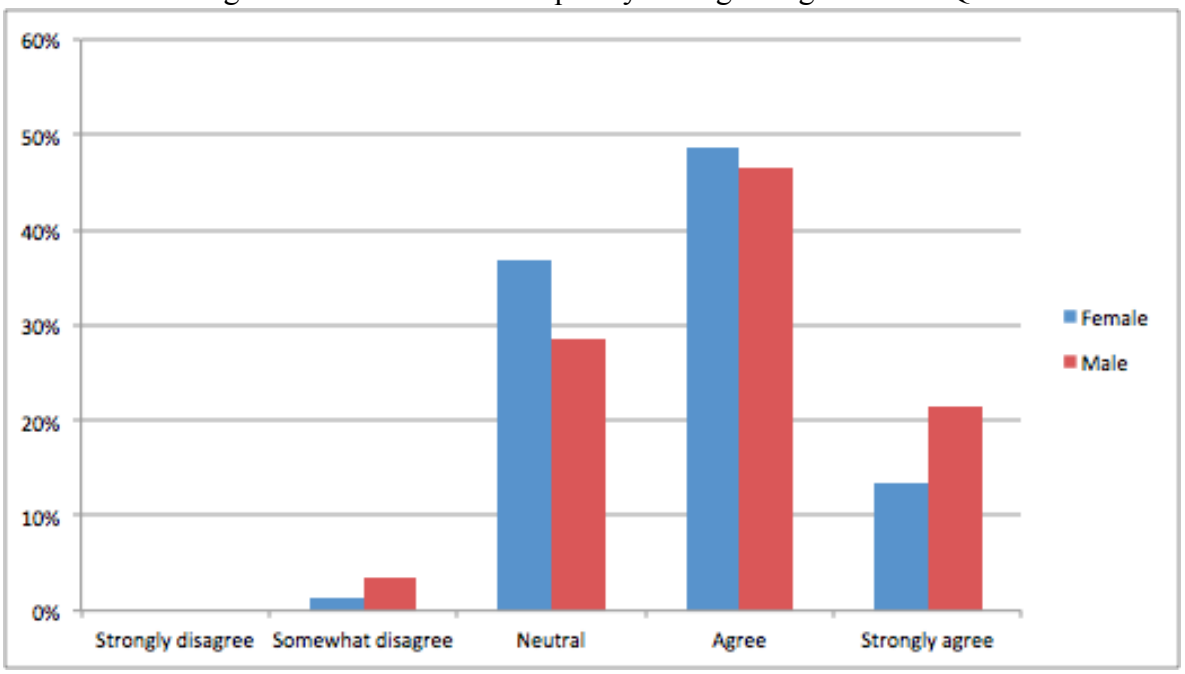


Table 18. Frequency distribution table: gender and Q7

	Female	**Male**
Strongly disagree	0	0
Somewhat disagree	2	1
Neutral	58	8
Agree	77	13
Strongly agree	21	6
Total	158	28
Fisher's Exact p=0.3577		

The adjacent histograms of the relative frequency above show a no-difference pattern; males experience the same distribution of levels of agreement with Q7, "Staff members who complete e-learning modules are well-informed," as women. This is confirmed by the Fisher's Exact Test (p=0.3577), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to gender.

Results for Q8:

Figure 16. Relative Frequency Histogram: gender and Q8

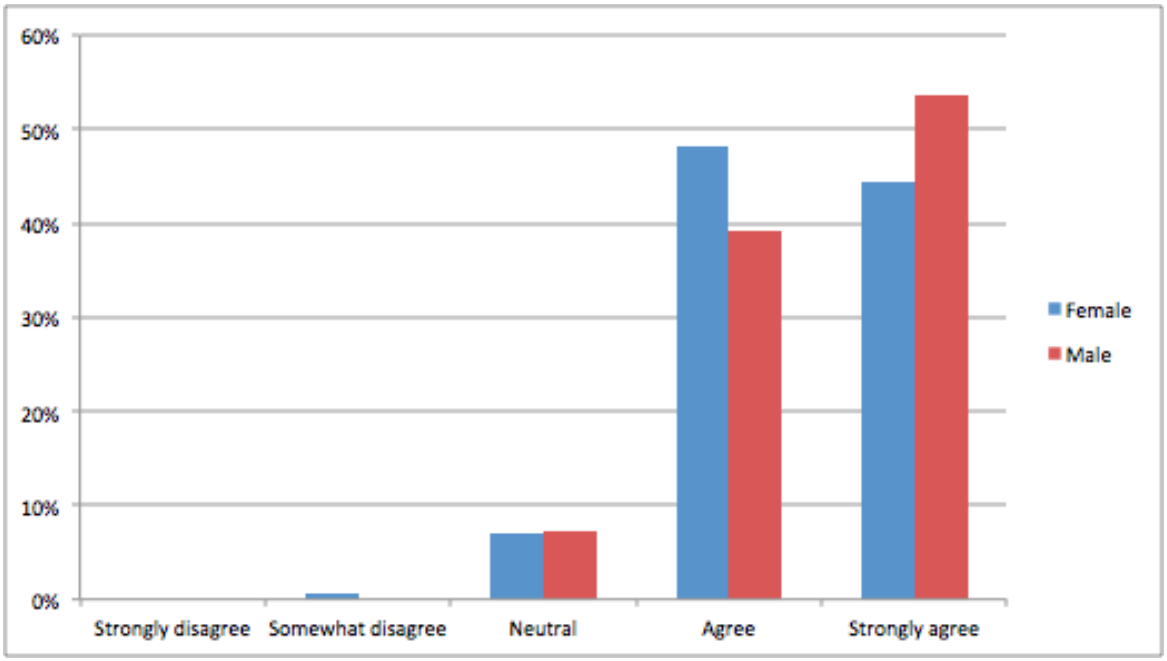


Table 19. Frequency distribution table: gender and Q8

	Female	**Male**
Strongly disagree	0	0
Somewhat disagree	1	0
Neutral	11	2
Agree	76	11
Strongly agree	70	15
Total	158	28
Fisher's Exact p=0.6463		

The adjacent histograms of the relative frequency above show a no-difference pattern; males experience the same distribution of levels of agreement with Q8, "Staff members who complete e-learning modules are well-informed," as women. This is confirmed by the Fisher's Exact Test ($p=0.6463$), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to gender.

On average, males were slightly more likely to consider e-learning to be effective, as shown in Table 20; however, these levels were not statistically significant. Males had a higher level of agreement with each statement related to the perceived effectiveness of e-learning, but not at a level that would be considered significant.

These findings are inconsistent with previous research (Ong & Lai, 2006; Tarhini, Hone, & Liu, 2014). Hypothesis 6, "*The perceived effectiveness (PE) of e-learning is different depending on the gender of the staff member,*" is not confirmed. This presents an opportunity for future study.

Table 20. Impact of gender on PE

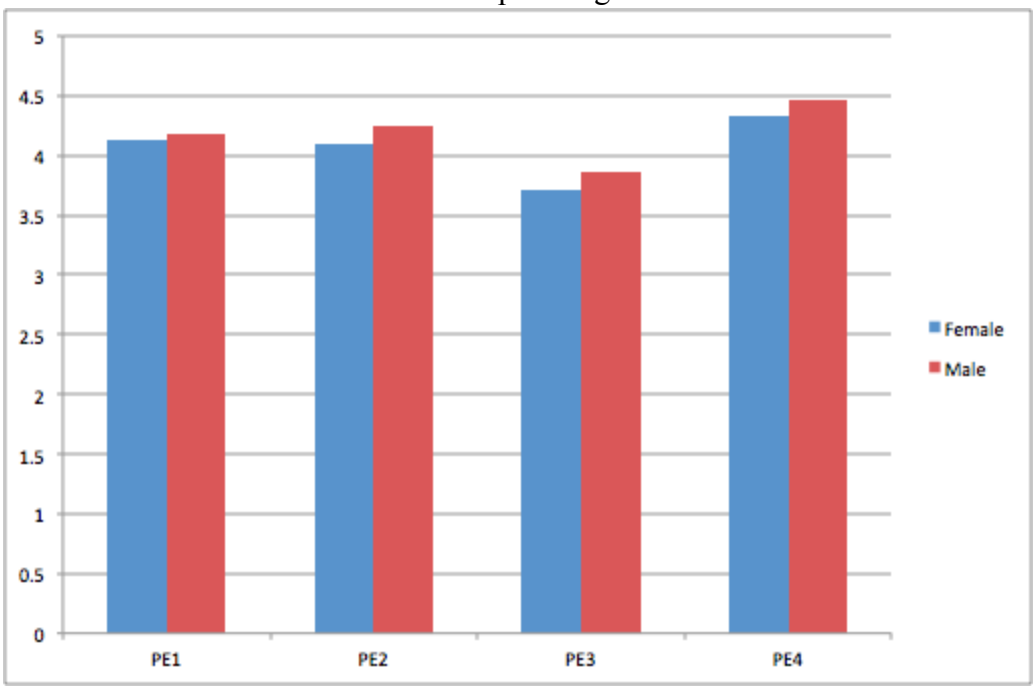


Table 21. Correlations: gender and PE

Gender:			**PE1**	**PE2**	**PE3**	**PE4**
Male n=28	PE1	Pearson Correlation				
	PE2	Pearson Correlation	.664			
	PE3	Pearson Correlation	.733	.709		
	PE4	Pearson Correlation	.602	.372	.496	
Female	PE1	Pearson Correlation				
	PE2	Pearson Correlation	.775			
	PE3	Pearson Correlation	.672	.688		
	PE4	Pearson Correlation	.689	.713	.621	
**. Correlation is significant at the 0.01 level (1-tailed).						
*. Correlation is significant at the 0.05 level (1-tailed).						

4.1.5 H5: Impact of age on perceived effectiveness of e-learning

This research hypothesis requires complete data from questions 3 and 5 through 8. If a response had missing data from any of those items, it was removed from this analysis. In all, 186

respondents were included in this analysis, where the age distribution is in the table below. Since the single respondent in the 20's age category had a representative profile of the 30's, that respondent was added to that age category in these analyses.

Table 22. Age distribution frequency

Age	**Frequency**
20's	1
30's	35
40's	33
50's	43
60's	56
70's	18
TOTAL	186

The data profile indicating support for the research hypothesis was that the younger-aged respondents (question 3) would show a higher-level of agreement in the value and effectiveness of e-learning as measured in questions 5-8:

5. E-learning is an effective way to learn new information.
6. E-learning modules are a valuable component in staff training programs.
7. Staff members who complete e-learning modules are well-informed.
8. E-learning provides a valuable opportunity to learn on-demand.

Since the Likert scale used represents an ordinal scale, the statistical test relied on visually comparing the distributions of agreement ratings followed by the non-parametric Fisher's Exact Test on the 2X2 contingency table where the negative and neutral ratings were collapsed into one category and the two positive rating points on the Likert scale were collapsed in the other. Since personal computers have been largely available in libraries for about 35 years, the age groups were collapsed to include those respondents in their 20's to 50's in the younger group (n=112) and those in their 60's and 70's in the older group (n=74).

Results for Q5:

Figure 17. Relative Frequency Histogram: age and Q5

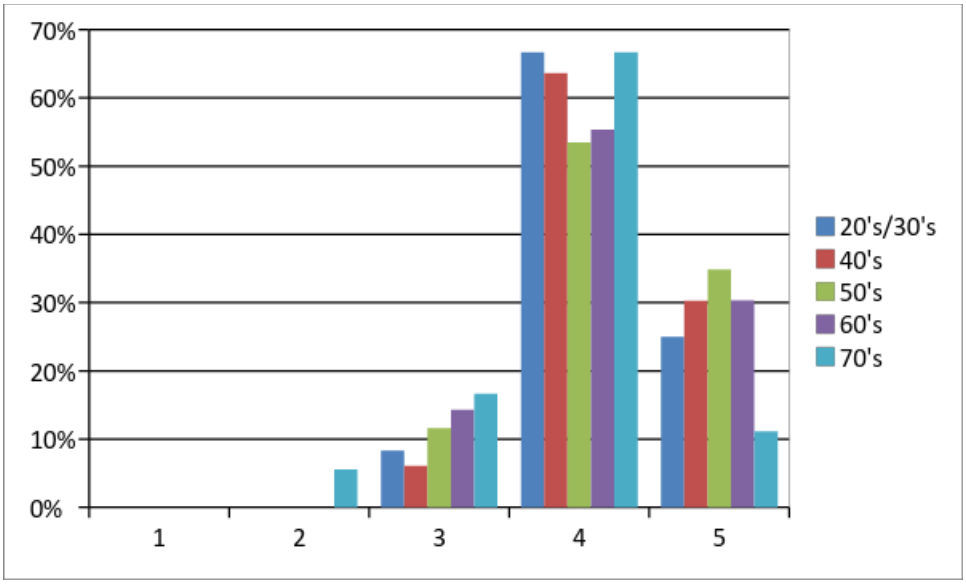


Table 23. Contingency table: age and Q5

Question 5	**Age 20 to 50**	**Age 60 to 70**
Negative/Neutral	10	12
Positive	102	62
Total	112	74
Fisher's Exact Test p=0.10		

The adjacent histograms of the relative frequency above show similar patterns across the age groups with the exception that the age 70 category has a suppressed frequency of strongly-agree ratings that e-learning is an effective way to learn new information. This is confirmed by the Fisher's Exact Test (p=0.10), which indicates a weak statistical tendency for older participants to have less agreement that e-learning is effective for learning new information.

Results for Q6:

Figure 18. Relative Frequency Histogram: age and Q6

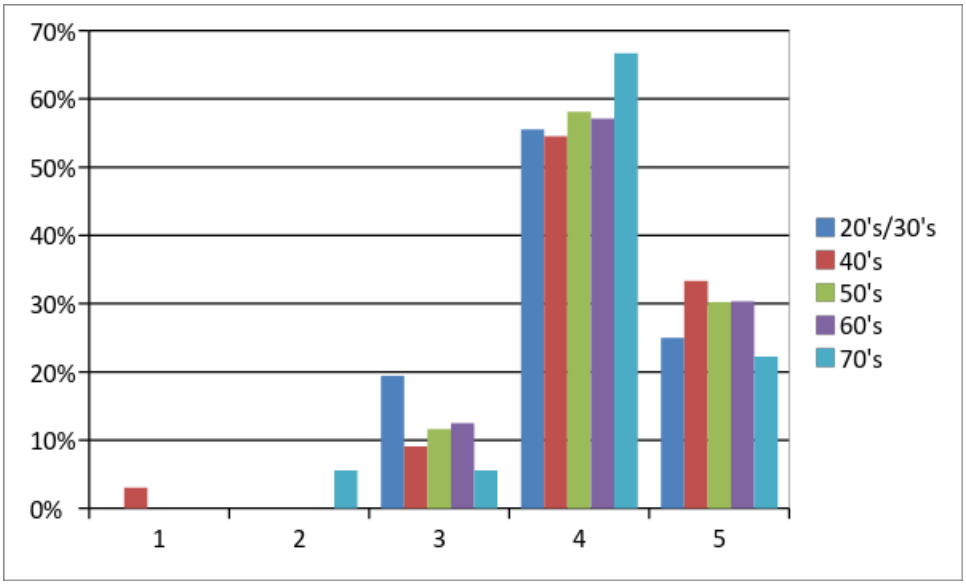


Table 24. Contingency table: age and Q6

Question 6	**Age 20 to 50**	**Age 60 to 70**
Negative/Neutral	16	9
Positive	96	65
Total	112	74
Fisher's Exact Test p=0.43		

The adjacent histograms of the relative frequency above show a similar pattern of levels agreement across all age categories that e-learning modules are a valuable component in staff training programs. This is confirmed by the Fisher's Exact Test (p=0.43), which clearly

indicates no statistical difference between agreement and disagreement or neutral according to age.

Results for Q7:

Figure 19. Relative Frequency Histogram: age and Q7

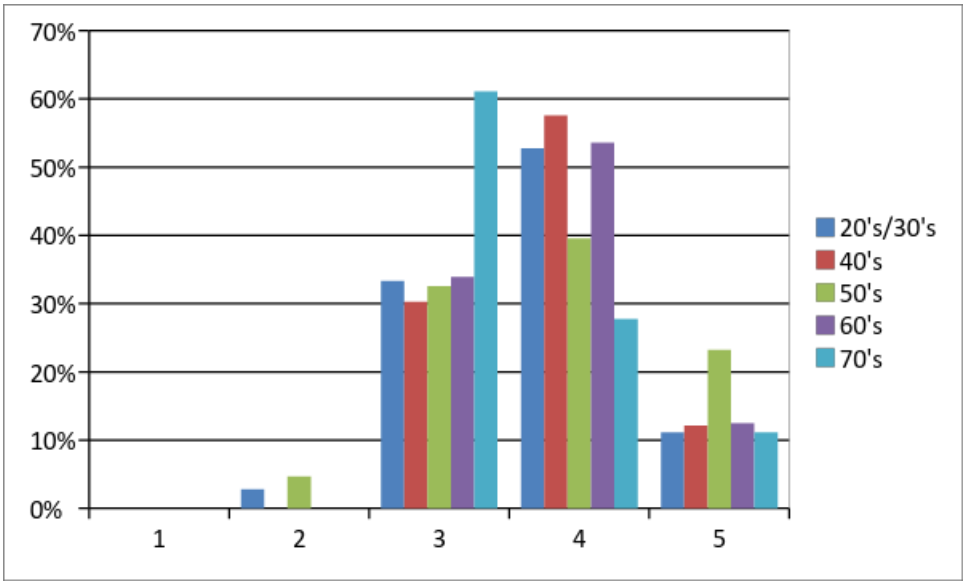


Table 25. Contingency table: age and Q7

Question 7	**Age 20 to 50**	**Age 60 to 70**
Negative/Neutral	39	30
Positive	73	44
Total	112	74
Fisher's Exact Test p=0.26		

The adjacent histograms of the relative frequency above show similar patterns across the age categories on the levels of agreement that staff member who complete e-learning modules are

well informed. This is confirmed by the Fisher's Exact Test (p=0.26), which clearly indicates a no statistical difference between agreement and disagreement or neutral according to the respondent's age.

Results for Q8:

Figure 20. Relative Frequency Histogram: age and Q8

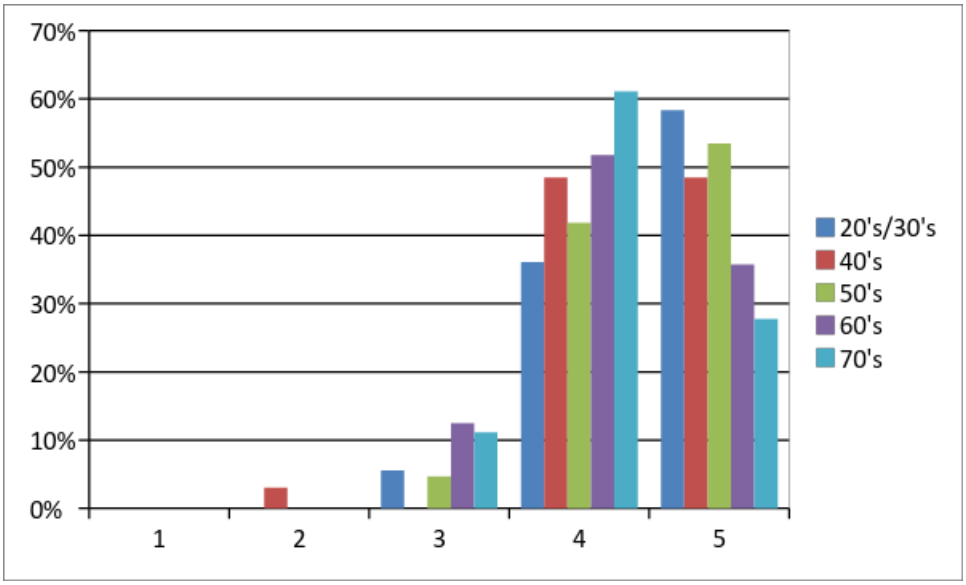


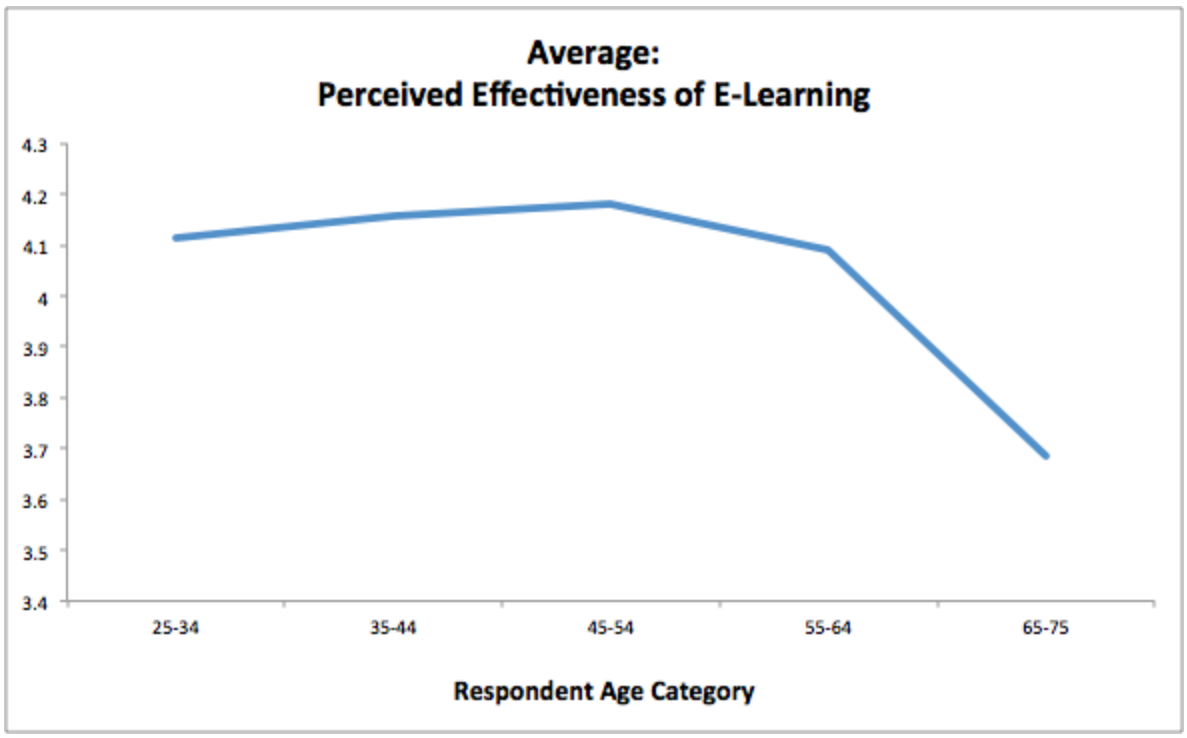
Table 26. Contingency table: age and Q8

Question 8	**Age 20 to 50**	**Age 60 to 70**
Negative/Neutral	5	9
Positive	107	65
Total	112	74
Fisher's Exact Test p=0.05		

The adjacent histograms of the relative frequency above show a pattern that those in the older age categories have lower levels of agreement that e-learning modules provide a valuable opportunity to learn on demand. This is confirmed by the Fisher's Exact Test (p=0.05), which indicates a strong statistical difference between agreement and disagreement or neutral according to the respondent's age.

The perceived effectiveness of e-learning (PE) was significantly different depending on the age of the survey respondent (Figure 21). We see a slight decline at the 45-54 mark, followed by a sharp decline at 55-64.

Figure 21. Age and Average PE



Users in the 65-75 age group had a slightly lower opinion of e-learning than their younger counterparts (Table 27). When asked to rate their level of agreement with the statement "E-learning in an effective way to learn new information," users between ages 25-64 had the highest rating for the statement; users older than 65 and younger than 24 placed less value on the effectiveness of e-learning as a method of instruction.

Table 27. Age and average PE

Age	Average Rating
25-34	4.1143
35-44	4.1591
45-54	4.1802
55-64	4.0893
65-75	3.6842

Age was not a good predictor of previous completion of e-learning; there was no correlation between age and previous completion of e-learning, as shown in Table 28.

Table 28. Age and EL

Age	Percentage who had previously completed an e-learning module
18-24	100%
25-34	83%
35-44	97%
45-54	77%
55-64	73%
65-75	84%

4.1.6 Results Summary

Based on the findings above, we can conclude the following:

- Users who have previously completed an e-learning module perceive e-learning to be an effective method of instruction. Users who have not previously completed an e-learning module may be hesitant to consider it an effective method of instruction. Experience with e-learning leads to positive opinions of its effectiveness.
- E-learning may not have a positive effect on the perceived usefulness of technology. Additional studies are needed.
- Completion of an e-learning module may not have a positive effect on the perceived ease of use of technology. Additional studies are needed.

- The correlation between the perceived ease of use of technology and usage behavior may not be affected by the completion of an e-learning module. Additional studies are needed.
- The correlation between the perceived usefulness of technology and usage behavior may not be affected by the completion of an e-learning module. Additional studies are needed.
- The perceived effectiveness of e-learning is not significantly different depending on the gender of the staff members. Additional studies are needed.
- The perceived effectiveness of e-learning is different depending on the age of the staff member; younger staff members are more likely to consider e-learning to be an effective instruction method.

4.2 PRACTICAL IMPLICATIONS AND RECOMMENDED BEST PRACTICES

This study demonstrates the impact of three factors on the effectiveness of e-learning: previous e-learning experience, gender, and age. Only one of these factors, e-learning experience, can be easily manipulated; the others are relatively fixed and, for the practical purposes of this study, will be considered unchangeable.

There are two significant findings of this study. The first, that prior e-learning experience increases the perceived effectiveness of e-learning, provides practical advice for library administrators; public library staff members who are hesitant to try e-learning should be encouraged and supported in their learning endeavors. These employees would then be more confident in future e-learning opportunities and would be more likely to perceive e-learning in a positive light. Previous studies have also suggested that requiring a basic computer literacy class

prior to the beginning of any e-learning modules would aid in the success of and satisfaction with e-learning modules (Sun et al, 2006). By increasing computer self-efficacy through traditional learning methods, library staff may be more comfortable attempting e-learning. Additional studies to determine the effects of computer self-efficacy should be considered.

The second finding, that the age of the learner affects the perceived effectiveness of e-learning, also provides valuable information. As learning programs are designed and implemented, it is important to understand the impact that perceived effectiveness of the learning method can have on the learner. Those who are less likely to perceive that a specific instructional method, like e-learning, is effective may be resentful if all learning opportunities are shifted to a digital platform. This finding encourages the offering of a multimodal training program for public library staff.

In regards to the factors of age and gender, however, one must consider the social and organizational structure that is affecting these results. Jeske et al (2012) recommend that organizations create a learning culture that is more social to appeal to older workers who may be uncomfortable with the technological nature of e-learning. Also, as younger workers age, "older workers" will no longer be those who may not have experience with e-learning; there may be a new technological innovation to consider. By fostering a positive, inclusive environment where the experience and knowledge of the older worker is highlighted (instead of focusing on any lack of technical acumen), older workers may become more comfortable with the concept of new learning techniques like e-learning.

This fostering of a positive, inclusive learning culture could also impact women's perspective of e-learning. If the social constructs surrounding e-learning are changed - for example, if there are more female instructional designers or female characters in e-learning modules - then perhaps women would feel more comfortable accepting e-learning. These additional factors could be studied in future research models to determine their impact on gender and the perception of e-learning.

4.3 OPPORTUNITIES FOR FUTURE STUDIES

Additional studies may want to extend the work of previous researchers and this model to conduct future studies related to public libraries. Findings related to the user's computer self-efficacy, instructional design, and organizational support would provide valuable insight for public library administrators. In addition, several social factors, like gender identity and the increase of women in technological fields, may affect the findings of this study. Future studies that more closely research the impact that these two social factors may have on e-learning and technology adoption would enhance this study's results.

In addition, it can be assumed that there is a bias in the delivery of this survey that would impact findings: since the survey was delivered electronically, users who responded may be more likely to have experience with technology and may be more technologically comfortable, affecting the results and skewing the data in a pro-technology slant. Future studies should examine user

motivation, technology self-efficacy, and computer anxiety as potential factors and should be delivered via non-electronic methods to eliminate this possible bias.

GENDER IDENTITY

Social and psychological constructs of gender have not been studied in the context of e-learning and its impact on technology adoption and innovation diffusion. While researchers can say that women are influenced by certain factors and men by others, no studies have been done to determine how those employees who identify as transgender, genderqueer, intersex or a non-binary gender may be influenced during the technology adoption process. This presents an opportunity for researchers to conduct future studies, especially considering American libraries' dedication to employing LGBTQ library staff and providing services and collections for regardless of sex, gender identity, gender expression, and sexual orientation (American Library Association, 2010).

INCREASING NUMBER OF WOMEN IN STEM ROLES

As women continue to increase their professional presence in STEM (science, technology, engineering, and math) fields, it is likely that the subjective norm that had previously impacted women's acceptance of technology would normalize and more closely match their male counterparts. Repeating previous studies with a group of female scientists, for example, may yield very different results. Comparing these new results with the previous studies' data to determine how subjective norms have changed over the years would be a useful study.

In addition, because several portions of our results were only partially explored, future studies could determine what impact e-learning has on certain constructs, like perceived usefulness of technology and the perceived ease of use of technology. Additional factors, like training effectiveness and organizational support, can be introduced into this model to determine if these have any impact on PU and PEU. Finally, determining what factors impact the effect of e-learning on usage behavior could yield useful results for instructional designers and change agents.

5. CONCLUSION

Virtually no research exists that has tested the impact of training of public library employees on technology acceptance. This study is an attempt to understand the impact of e-learning on the technology acceptance rates of public library staff, with an intention to develop best practices and guidelines in curriculum development and training delivery.

This study has identified two unique findings:

- If a staff member in a public library has completed an e-learning module, they are more likely to consider it a valuable instructional method.
- Older staff members in public libraries are generally less likely to perceive e-learning as effective, valid, and useful instructional tools.

By bringing Davis's Technology Acceptance Model into the realm of public libraries, we can explore the factors and characteristics that affect technology acceptance at a time when technology adoption is critical to the ongoing success of these community anchors. Future studies that extend the research conducted here will be very valuable as public library staff continue to offer new, innovative programs and services to meet the needs of the public.

APPENDIX A. ONLINE SURVEY INVITATION EMAILS

GEORGIA PUBLIC LIBRARY SERVICE

Julia Huprich <jhuprich@georgialibraries.org>

Survey Invitation: Perceived Effectiveness of e-Learning in Public Library Staff

1 message

Julia Huprich <jhuprich@georgialibraries.org> Fri, Jun 10, 2016 at 6:08 PM
To: pld-l@list.georgialibraries.org

Good evening Directors,

I am writing to invite you and your staff to participate in a brief survey, which is being conducted in fulfillment of Master of Science in Information Technology degree requirements at Kennesaw State University.

The purpose of this research study is to determine the perceived effectiveness of e-learning for staff members in public libraries; a secondary goal is to identify factors that predict staff members' acceptance of technology after completion of e-learning.

The survey is very brief and will take less than 10 minutes to complete. Please click the link below to go to the survey Web site (or copy and paste the link into your internet browser).

Survey: https://www.surveymonkey.com/r/e-learning_in_libraries

Your participation in the survey is completely voluntary and all of your responses will be kept confidential. No personally identifiable information will be associated with your responses to any reports of these data.

There are no risks associated with this survey. The KSU Institutional Review Board has reviewed and approved this survey.

While there are no direct benefits for survey participants, this research will improve e-learning curriculum development to enhance technology instruction programs for staff in public libraries.

Thank you very much for your assistance with this survey. Should you or your staff have any questions, please do not hesitate to contact me.

Sincerely,

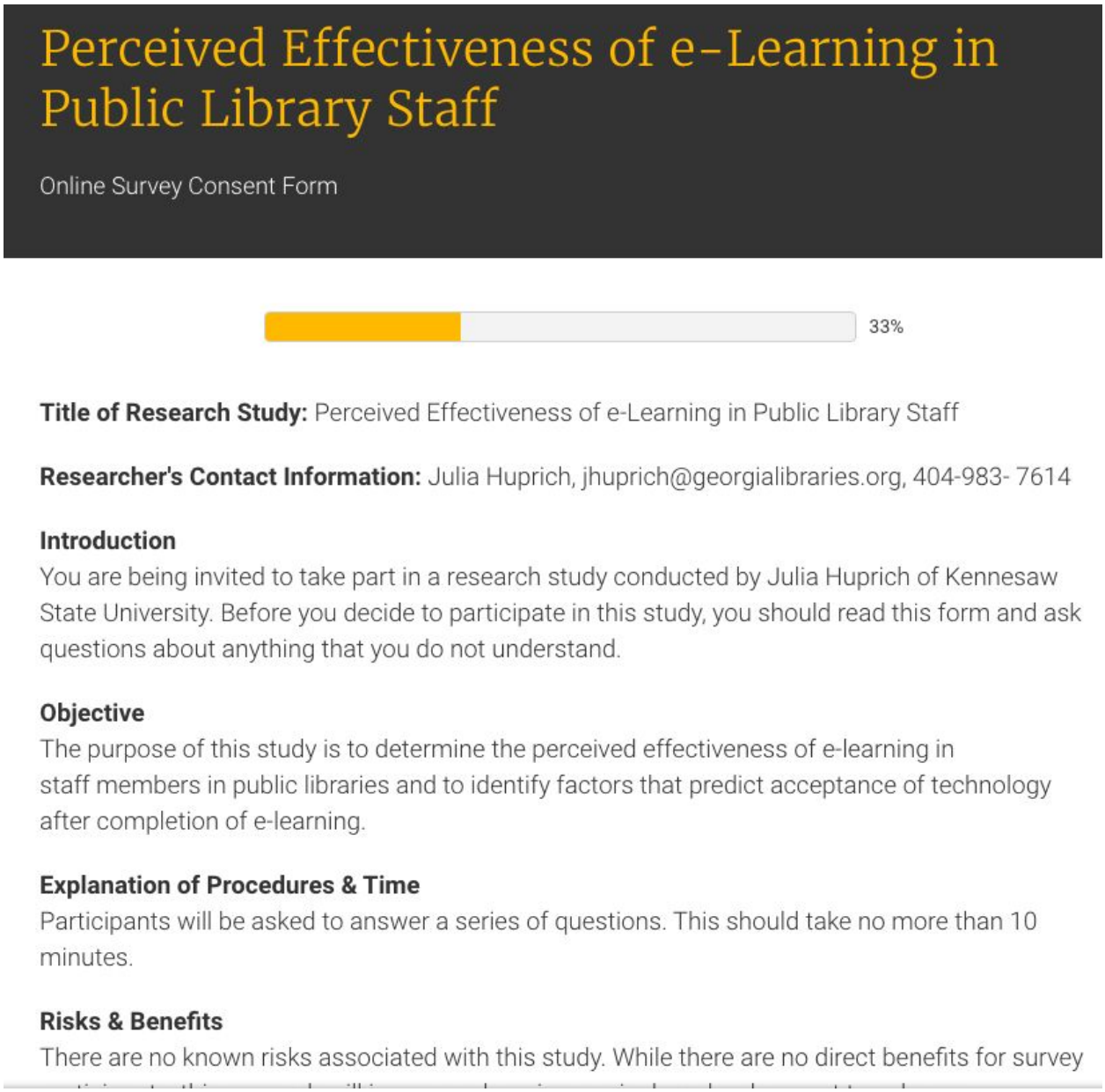
Julia

--
Julia Huprich
Director of Training & Continuing Education
Georgia Public Library Service
A Unit of the University System of Georgia
1800 Century Place, Suite 150
Atlanta, GA 30345
jhuprich@georgialibraries.org
404-235-7124 office
404-323-2024 mobile

APPENDIX B. SURVEY INVITATION EMAIL AND DESTINATIONS

Destination/List	Description	Date Sent
pld@list.georgialibraries.org	Mailing list administered by the Georgia Public Library Service; includes all public library directors in Georgia	June 10, 2016
techtalk@list.georgialibraries.org	Mailing list administered by the Georgia Public Library Service; includes technology support personnel in public libraries	June 13, 2016
TLA-L@listserv.utk.edu	Mailing list administered by the University of Tennessee-Knoxville; includes members of the Tennessee Library Association	June 13, 2016
learnrt@lists.ala.org	Open mailing list; administered by the American Library Association of all current and former members of the Learning Round Table	June 14, 2016

APPENDIX C. INFORMED CONSENT AGREEMENT



Perceived Effectiveness of e-Learning in Public Library Staff

Online Survey Consent Form

33%

Title of Research Study: Perceived Effectiveness of e-Learning in Public Library Staff

Researcher's Contact Information: Julia Huprich, jhuprich@georgialibraries.org, 404-983- 7614

Introduction

You are being invited to take part in a research study conducted by Julia Huprich of Kennesaw State University. Before you decide to participate in this study, you should read this form and ask questions about anything that you do not understand.

Objective

The purpose of this study is to determine the perceived effectiveness of e-learning in staff members in public libraries and to identify factors that predict acceptance of technology after completion of e-learning.

Explanation of Procedures & Time

Participants will be asked to answer a series of questions. This should take no more than 10 minutes.

Risks & Benefits

There are no known risks associated with this study. While there are no direct benefits for survey

Figure (#). Page 1 of Informed Consent Agreement

Risks & Benefits
There are no known risks associated with this study. While there are no direct benefits for survey participants, this research will improve e-learning curriculum development to enhance technology instruction programs.

Confidentiality
The results of this participation will be anonymous.

Inclusion Criteria for Participation
You must be 18 years of age or older to participate in this study.

Use of Online Survey
IP Addresses will not be collected as part of this survey.

IRB Statement
Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, 585 Cobb Avenue, KH3403, Kennesaw, GA 30144-5591, (470) 578-2268.

PLEASE PRINT A COPY OF THIS CONSENT DOCUMENT FOR YOUR RECORDS, OR IF YOU DO NOT HAVE PRINT CAPABILITIES, YOU MAY CONTACT THE RESEARCHER TO OBTAIN A COPY.

* 1 Please select one of the following:

- ◯ I agree and give my consent to participate in this research project. I understand that participation is voluntary and that I may withdraw my consent at any time without penalty.
- ◯ I do not agree to participate and will be excluded from the remainder of the questions.

Next ▸

Figure (#). Page 2 of Informed Consent Agreement.

APPENDIX D. PARTICIPANT ONLINE SURVEY QUESTIONS

Thank you for participating in this survey. Please take a few moments to answer some questions related to your experiences and perceptions of e-learning.

1. I work in a public library.
    a. True
    b. False

2. I have previously completed an e-learning module for professional development.
    a. True
    b. False

3. Your age:
    a. < 18
    b. 18-24
    c. 25-34
    d. 35-44
    e. 45-54
    f. 55-64
    g. 65-75
    h. > 75
    i. Decline to answer

4. Your gender:
    a. Male
    b. Female
    c. Decline to answer

5. E-learning is an effective way to learn new information.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

6. E-learning modules are a valuable component in staff training programs.
    a. Strongly agree
    b. Agree
    c. Neutral

d. Somewhat disagree
e. Strongly disagree
f. Decline to answer

7. Staff members who complete e-learning modules are well-informed.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

8. E-learning provides a valuable opportunity to learn on-demand.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

9. Understanding the importance of new technology is easier if I have access to an e-learning module.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

10. Completing an e-learning module could help me understand why new technology is being implemented in the library.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

11. E-learning modules are effective ways to learn how to use technology tools in libraries.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

12. Learning about new devices and technologies is easier through e-learning than through other instructional methods, like face-to-face classes or hands-on workshops.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

13. After completing an e-learning module about new technology, it is likely that staff would feel confident using it in the library.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

14. After completing an e-learning module about new technology, it is likely that staff would feel confident sharing their knowledge with others.
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Somewhat disagree
    e. Strongly disagree
    f. Decline to answer

APPENDIX E. CORRELATION COEFFICIENTS FOR FUTURE STUDIES

	PE1	PE2	PE3	PE4	PU1	PU2	PEU1	PEU2	UB1	UB2
PE1	1.000									
PE2	0.758	1.000								
PE3	0.685	0.696	1.000							
PE4	0.704	0.701	0.617	1.000						
PU1	0.565	0.577	0.583	0.544	1.000					
PU2	0.575	0.611	0.616	0.584	0.629	1.000				
PEU1	0.588	0.647	0.595	0.637	0.630	0.641	1.000			
PEU2	0.335	0.333	0.454	0.295	0.406	0.371	0.389	1.000		
UB1	0.496	0.473	0.547	0.380	0.498	0.471	0.579	0.549	1.000	
UB2	0.427	0.368	0.492	0.387	0.479	0.480	0.534	0.491	0.821	1.000

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